

✓ 0
ORIGINAL

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF TEXAS
DALLAS DIVISION

U.S. DISTRICT COURT NORTHERN DISTRICT OF TEXAS FILED FEB 21 2008 CLERK, U.S. DISTRICT COURT By <u>NT</u> Deputy
--

RESEARCH IN MOTION LIMITED and
RESEARCH IN MOTION CORPORATION

Plaintiffs,

v.

MOTOROLA, INC.,

Defendant.

§
§
§
§
§
§
§
§
§
§

Civil Action No.

3-08 CV 0317-0

Jury Trial Demanded

19473

COMPLAINT FOR DECLARATORY JUDGMENT
(Jury Trial Demanded)

Plaintiffs Research In Motion Limited and Research In Motion Corporation (collectively, "RIM") bring this action to obtain a declaratory judgment that (i) United States Patent Nos. 5,157,391, 5,394,140, 5,612,682, and 5,974,447 (collectively, the "Motorola patents") are invalid; and (ii) RIM's manufacture, use, offer for sale, and sale of any of its products does not infringe any valid claim of any of the Motorola patents.

THE PARTIES

1. Research In Motion Limited is a corporation organized and existing under the laws of Canada, having a principal place of business at 295 Phillip Street, Waterloo, Ontario, N2L 3W8 Canada. Research In Motion Corporation is a corporation organized and existing under the laws of Delaware, having a principal place of business at 5000 Riverside Drive, Irving, Texas 75039. At all times relevant to this Complaint, RIM conducted business in the state of Texas.

2. Founded in 1984, RIM has grown rapidly to become a leading designer, manufacturer and marketer of innovative wireless solutions for the worldwide mobile communications market.

3. Through the development of integrated hardware, software and services that support multiple wireless network standards, RIM provides platforms and solutions for seamless access to time-sensitive information including e-mail, phone, text messaging (SMS and MMS), Internet and intranet-based applications. RIM technology also enables a broad array of third party developers and manufacturers to enhance their products and services with wireless connectivity to data.

4. Motorola is a corporation organized and existing under the laws of Delaware, having a principal place of business at 1303 E. Algonquin Road, Schaumburg, IL 60196. At all times relevant to this Complaint, Motorola conducted business in the Northern District of Texas.

JURISDICTION AND VENUE

5. The Court has jurisdiction over this action pursuant to the Federal Patent Act, 28 U.S.C. §§ 1331, 1338(a), 2201, and 2202.

6. Venue is proper in this District under 28 U.S.C. § 1391. Motorola maintains a regular and established place of business in this District.

FACTUAL ALLEGATIONS

7. RIM entered into a Cellular Essential Properties Cross License Agreement with Motorola on March 28, 2003 ("2003 Cross-License Agreement"). Under this agreement, Motorola granted RIM a non-exclusive worldwide license to practice patents that Motorola claimed were essential to various standards, including the GSM, GPRS, and UMTS standards described herein, as well as rights to a number of non-essential Motorola patents.

8. The term of the 2003 Cross-License Agreement was five years. In addition, the agreement had a specific provision governing extension of its terms and conditions. Section 5.3 of the agreement states: "At least one year prior to termination of this Agreement, RIM and MOTOROLA agree to begin good faith negotiations, related to the terms and conditions of this Agreement to extend the terms and conditions hereof beyond the date of termination."

9. In the course of the parties' 2007-08 negotiations to extend the term of the 2003 Cross-License Agreement, Motorola accused RIM of infringing a number of Motorola patents. Motorola threatened to sue RIM, and to attempt to enjoin its business, based on these patents.

10. During the parties' negotiations, Motorola supported its infringement accusations in part by providing RIM with claim charts purporting to compare certain claims of the Motorola patents to various RIM products. The claim chart contained claims from, among others, U.S. Patent No. 5,157,391 ("the '391 patent"), attached hereto as Exhibit 1; U.S. Patent No. 5,394,140 ("the '140 patent"), attached hereto as Exhibit 2; U.S. Patent No. 5,612,682 ("the '682 patent"), attached hereto as Exhibit 3; and U.S. Patent No. 5,974,447 ("the '447 patent"), attached hereto as Exhibit 4.

11. RIM does not disclose the specifics of the Motorola claim charts here, because as part of Motorola's efforts to impose unfavorable terms on licensees, Motorola insists that parties seeking to negotiate a license enter into non-disclosure agreements that prevent disclosure of certain information relation to the negotiations.

12. RIM believes that none of its products infringes any of the Motorola patents and that the Motorola patents are invalid.

13. The parties' negotiations concerning an extension of the 2003 Cross-License Agreement have broken down. On February 15, 2007, Motorola filed a complaint in the United

States Eastern District Court of Texas alleging, among other matters, that RIM infringes the Motorola patents.

14. Motorola's accusations of infringement, the breakdown of the negotiations in which such accusations arose, and its filing of a complaint alleging infringement give rise to a case of actual controversy within the jurisdiction of this Court, pursuant to 28 U.S.C. §§ 2201 and 2202.

CLAIMS FOR RELIEF

CLAIM ONE

(Declaratory Judgment '391 Patent)

15. RIM repeats and re-alleges all of the allegations in all of the paragraphs above, as if set forth fully herein.

16. Each of the claims of the '391 patent is invalid for failure to comply with the conditions of patentability of, *inter alia*, 35 U.S.C. §§ 101, 102, 103 and/or 112.

17. A copy of the '391 Patent is attached hereto as Exhibit 1.

18. RIM has not infringed, directly, indirectly, or otherwise any valid claim of any of the '391 patent.

19. To resolve the legal and factual questions raised by Motorola and to afford relief from the uncertainty and controversy which Motorola's accusations have precipitated, RIM is entitled to a declaratory judgment that it does not infringe the '391 patent and that the '391 patent is invalid.

CLAIM TWO

(Declaratory Judgment '140 Patent)

20. RIM repeats and re-alleges all of the allegations in all of the paragraphs above, as if set forth fully herein.

21. Each of the claims of the '140 patent is invalid for failure to comply with the conditions of patentability of, *inter alia*, 35 U.S.C. §§ 101, 102, 103 and/or 112.

22. A copy of the '140 Patent is attached hereto as Exhibit 2.

23. RIM has not infringed, directly, indirectly, or otherwise any valid claim of any of the '140 patent.

24. To resolve the legal and factual questions raised by Motorola and to afford relief from the uncertainty and controversy which Motorola's accusations have precipitated, RIM is entitled to a declaratory judgment that it does not infringe the '140 patent and that the '140 patent is invalid.

CLAIM THREE

(Declaratory Judgment '682 Patent)

25. RIM repeats and re-alleges all of the allegations in all of the paragraphs above, as if set forth fully herein.

26. Each of the claims of the '682 patent is invalid for failure to comply with the conditions of patentability of, *inter alia*, 35 U.S.C. §§ 101, 102, 103 and/or 112.

27. A copy of the '682 Patent is attached hereto as Exhibit 3.

28. RIM has not infringed, directly, indirectly, or otherwise any valid claim of any of the '682 patent.

29. To resolve the legal and factual questions raised by Motorola and to afford relief from the uncertainty and controversy which Motorola's accusations have precipitated, RIM is entitled to a declaratory judgment that it does not infringe the '682 patent and that the '682 patent is invalid.

CLAIM FOUR

(Declaratory Judgment '447 Patent)

30. RIM repeats and re-alleges all of the allegations in all of the paragraphs above, as if set forth fully herein.

31. Each of the claims of the '447 patent is invalid for failure to comply with the conditions of patentability of, *inter alia*, 35 U.S.C. §§ 101, 102, 103 and/or 112.

32. A copy of the '447 Patent is attached hereto as Exhibit 4.

33. RIM has not infringed, directly, indirectly, or otherwise any valid claim of any of the '447 patent.

34. To resolve the legal and factual questions raised by Motorola and to afford relief from the uncertainty and controversy which Motorola's accusations have precipitated, RIM is entitled to a declaratory judgment that it does not infringe the '447 patent and that the '447 patent is invalid.

PRAYER FOR RELIEF

WHEREFORE, RIM respectfully requests that this Court:

Determine and declare that the claims of the '391 patent are invalid;

Determine and declare that the claims of the '391 patent are not infringed by RIM;

Determine and declare that the claims of the '140 patent are invalid;

Determine and declare that the claims of the '140 patent are not infringed by RIM;

Determine and declare that the claims of the '682 patent are invalid;

Determine and declare that the claims of the '682 patent are not infringed by RIM;

Determine and declare that the claims of the '447 patent are invalid;

Determine and declare that the claims of the '447 patent are not infringed by RIM;

Award RIM costs of this action, including reasonable attorneys fees; and

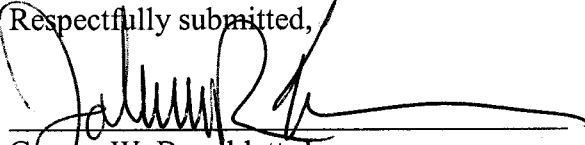
Grant such other further relief as the Court deems appropriate.

DEMAND FOR JURY TRIAL

Plaintiff RIM hereby demands trial by jury in this action on all issues so triable.

Dated: February 21, 2008

Respectfully submitted,



George W. Bramblett, Jr.

george.bramblett@haynesboone.com

Texas State Bar No. 02867000

Phillip B. Philbin

phillip.philbin@haynesboone.com

Texas State Bar No. 15909020

John R. Emerson

russ.emerson@haynesboone.com

Texas State Bar No. 24002053

HAYNES AND BOONE, LLP

901 Main Street, Suite 3100

Dallas, Texas 75202-3789

Tel: 214-651-5000

Fax: 214-651-5940

William F. Lee

Michelle D. Miller

Dominic E. Massa

WILMER CUTLER PICKERING HALE AND DORR
LLP

60 State Street

Boston, MA 02109

Tel: 617-526-6000

Fax: 617-526-5000

ATTORNEYS FOR PLAINTIFFS, RESEARCH IN
MOTION LIMITED AND RESEARCH IN MOTION
CORPORATION

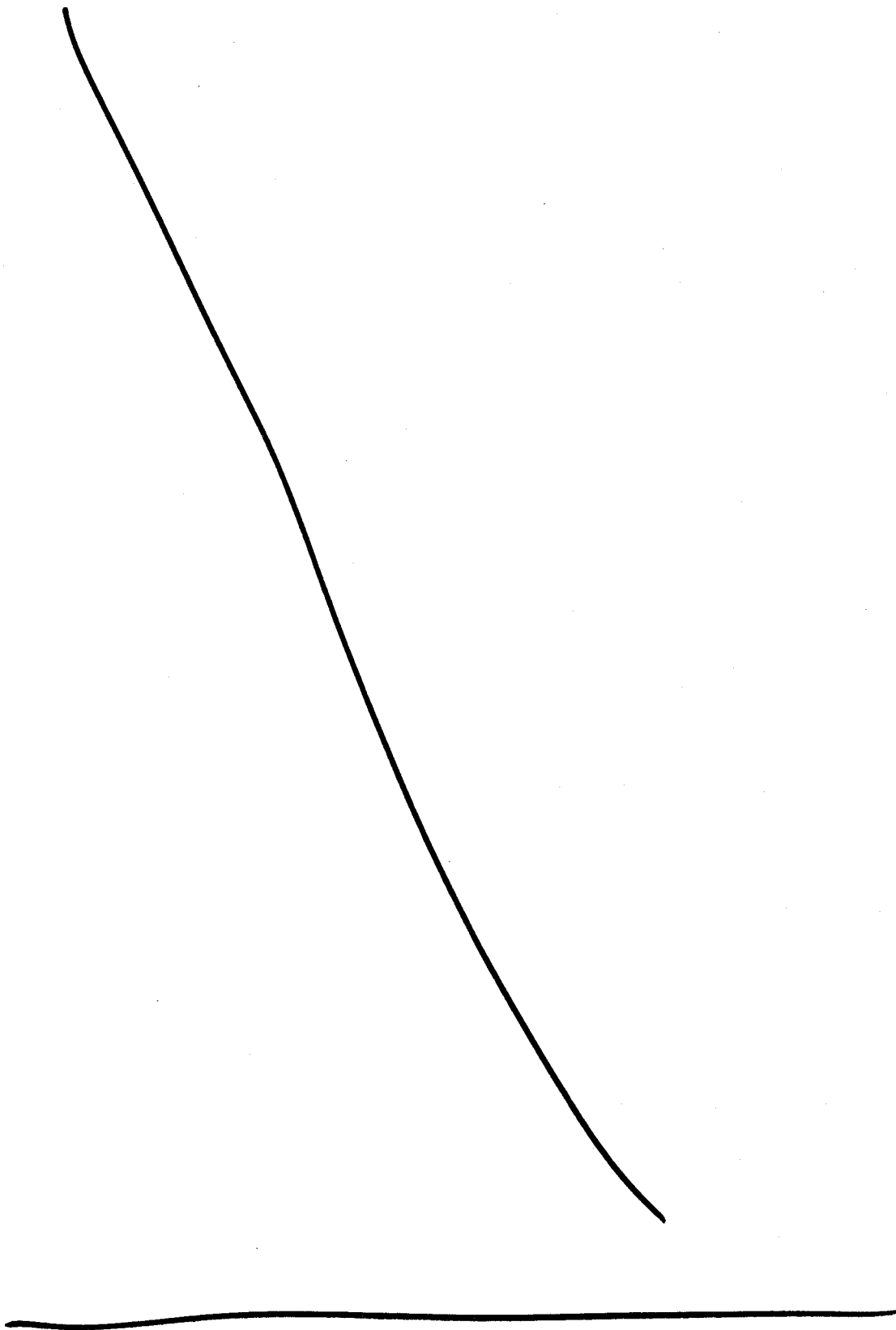


Exhibit 1





US005157391A

United States Patent [19]

Weitzen

[11] **Patent Number:** **5,157,391**[45] **Date of Patent:** **Oct. 20, 1992**

[54] **APPARATUS AND METHOD FOR
DISPLAYING A PLURALITY OF FUNCTION
INDICATORS IN A SELECTIVE CALL
RECEIVER**

[75] **Inventor:** **Randi F. Weitzen, Boynton Beach,
Fla.**

[73] **Assignee:** **Motorola, Inc., Schaumburg, Ill.**

[21] **Appl. No.:** **402,740**

[22] **Filed:** **Sep. 5, 1989**

[51] **Int. Cl.⁵** **H04Q 7/00**

[52] **U.S. Cl.** **340/825.44; 340/311.1**

[58] **Field of Search** **340/311.1, 709, 710,
340/711, 765, 815.06, 825.44, 825.31, 825.46,
825.47, 825.48; 341/20, 22; 358/194.1; 368/69,
70, 224; 364/709.12, 709.13, 709.14, 709.15,
709.16; 370/93**

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,354,260 10/1982 Planzo 364/709.15
4,419,668 6/1983 Davis et al. 340/825.44
4,549,279 10/1985 Lapeyre 364/709.15
4,713,808 12/1987 Gaskill et al. 370/93

4,766,746 8/1988 Henderson et al. 340/825.31
4,829,466 5/1989 Davis et al. 364/900
4,857,898 8/1989 Smith 341/22
4,864,592 9/1989 Lee 364/709.12

OTHER PUBLICATIONS

Motorola "PMR200", 1986, pp. 2-5 (anonymous author(s)).

Primary Examiner—Donald J. Yusko

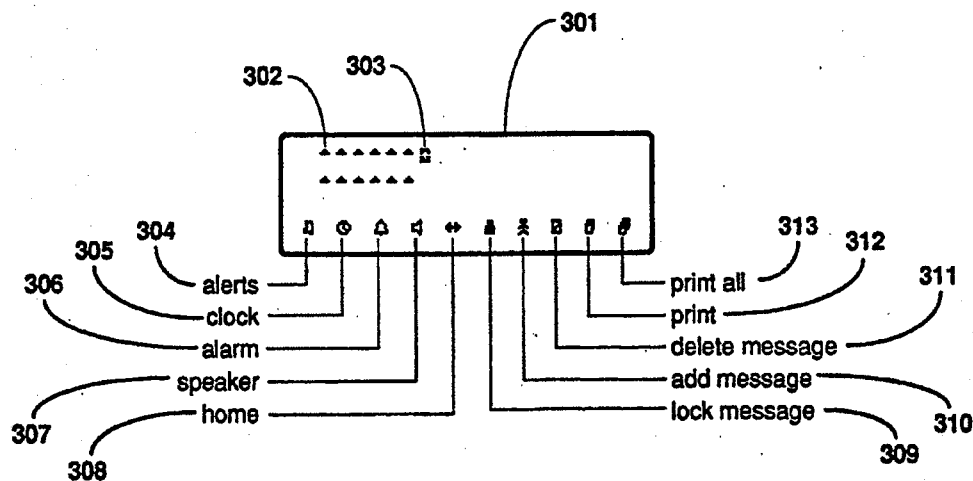
Assistant Examiner—Dervis Magistre

Attorney, Agent, or Firm—Gregg E. Rasor; Vincent B. Ingrassia; William E. Koch

[57] **ABSTRACT**

In a selective call receiver, an apparatus and method are provided for accessing one or more operational functions via a plurality of displayed function indicators. The function indicators are categorized in sets with a first set representing a selective call receiver status mode that allows alteration of operating characteristics associated with a selective call receiver, and a second set representing a message read mode for controlling the disposition of received messages.

9 Claims, 3 Drawing Sheets



U.S. Patent

Oct. 20, 1992

Sheet 1 of 3

5,157,391

FIG. 1
Prior Art

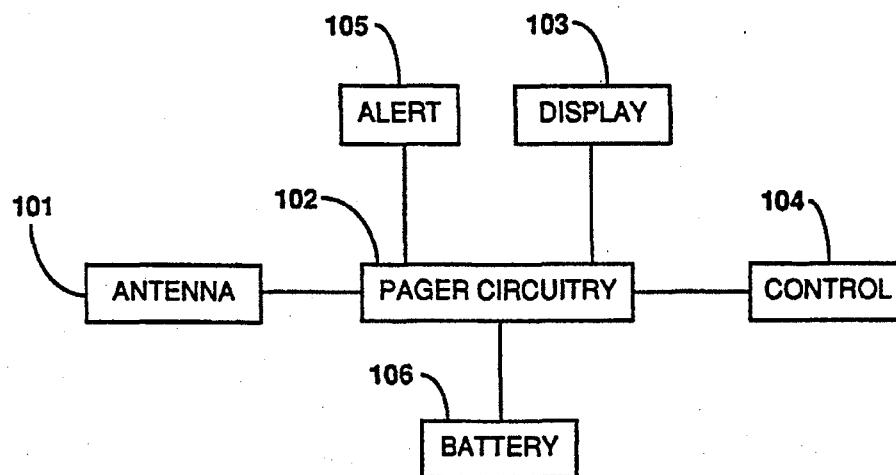
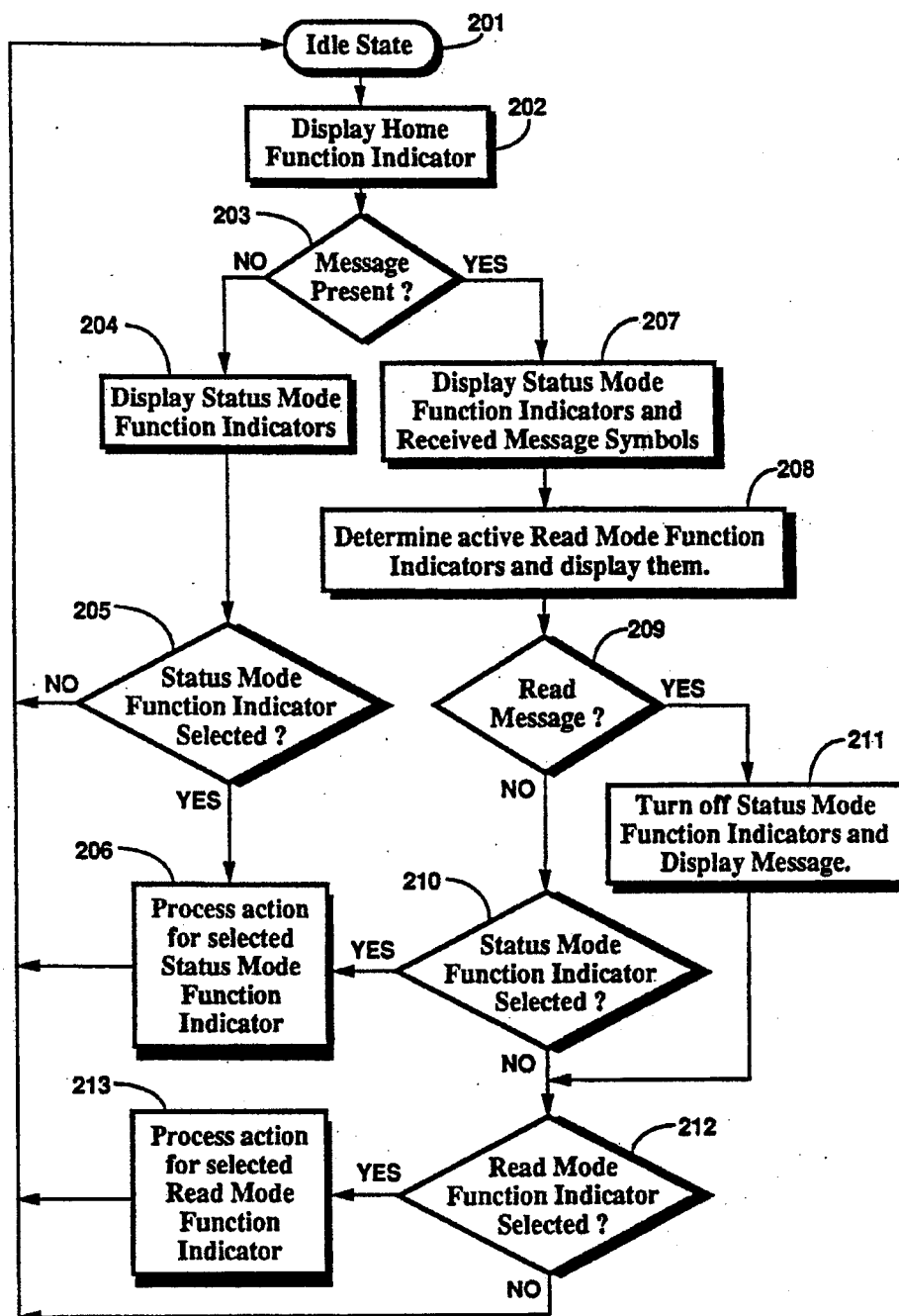


FIG. 2



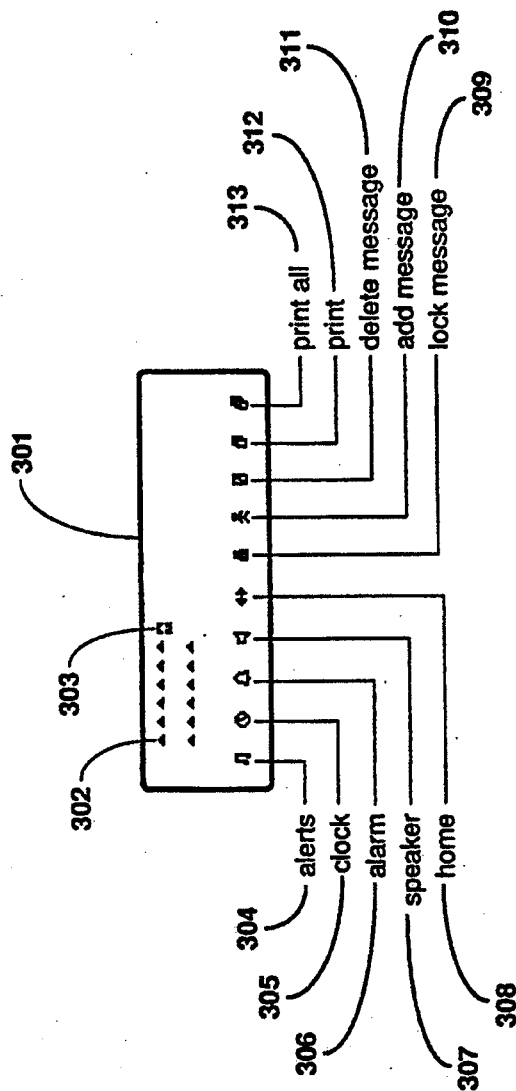
U.S. Patent

Oct. 20, 1992

Sheet 3 of 3

5,157,391

FIG. 3



5,157,391

1

APPARATUS AND METHOD FOR DISPLAYING A PLURALITY OF FUNCTION INDICATORS IN A SELECTIVE CALL RECEIVER

FIELD OF THE INVENTION

This invention relates in general to selective call receivers and more particularly to the menu driven alteration of configuration parameters and information stored within a selective call receiver.

BACKGROUND OF THE INVENTION

Selective call receivers for displaying or presenting information are well known. As technology advances, the marketplace dictates that more features are to be offered on a selective call receiver. In order to access these features, manufacturers have included an array of switches used singularly or in combination to access a specific feature. To achieve user friendly operation of a selective call receiver, the keystroke operation sequence to access a feature must be kept to a minimum. Because of size constraints, the number of switches on a typical selective call receiver is limited to four. Using four switches as an example, the current technology using single keystroke commands can execute four functions directly from the front panel. If one of the switches is designated as a shift operator, the other three can be multiplexed into addressing six functions from the front panel. More functions can be multiplexed on a doubly or triply shifted level but this presents the need for the casual user who has not memorized the operating sequence to refer to an operating manual. Thus, what is needed is a method utilizing a menu driven interface which provides function access using a minimal number of keystrokes.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an improved method of accessing one or more functions using a menu driven interface to provide for the alteration of configuration parameters and information stored within a selective call receiver.

In carrying out the above and other objects of the invention in one form, there is provided a method for presenting function indicators on a selective call receiver capable of receiving a message, displaying in a first mode a first set of function indicators associated with the first mode and a message, and displaying in a second mode a second set of function indicators associated with the second mode.

BRIEF DESCRIPTION OF THE INVENTION

FIG. 1 is a block diagram of a prior art selective call receiver system.

FIG. 2 is a flow chart of the decision tree used in accordance with a preferred embodiment.

FIG. 3 is a drawing of the display screen used in accordance with the preferred embodiment.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, pager circuitry 102 provides an alert 105 and a message on the display 103 in response to an RF signal received by the antenna 101. The user selects one or more functions by activating controls 104. The selective call receiver shown in FIG. 1 is well known to those skilled in the art.

2

Referring to FIG. 2, the flow chart shows a decision tree which controls the display of function indicators that represent specific function actions. In the standby mode, the controller waits in an idle state 201. When the user invokes the function menu, the home function indicator is displayed 202 and the controller checks for the presence of at least one message 203. If no messages are present, the selective call receiver displays status mode function indicators 204. The controller then checks for the selection of a status mode function indicator 205. When a status mode function indicator has been selected, the controller processes the action associated with the selected status mode function indicator 206. In all cases, when the selected action has been completed or the user chooses to escape from the sequence, control is returned to the idle state 201.

If the controller is in the idle state 201 and at least one message has been received by the selective call receiver, when the user invokes the function menu, the home function indicator is displayed 202 and the message present test 203 is true. The controller displays the status mode function indicators and received message symbols 207, then determines which read mode function indicators are active by examining information associated with the selected message to uniquely associate specific read mode function indicators with the selected message and display these function indicators 208. If the user chooses to read the message 209, the status mode indicators are turned off and the message is displayed 211. The user may then select an active read mode indicator 212 and process the action associated with the selected mode indicator 213. If the user does not choose to read the selected message 209, the options are to select either a status mode indicator 210 and its associated action 206 or a read mode indicator 212 and its associated action 213. In all cases, when the selected action has been completed or the user chooses to escape from the sequence, control is returned to the idle state 201.

Referring to FIG. 3, the preferred embodiment of a display screen layout 301 is shown. The filled triangles are received message symbols 302 which represent message slots (information storage "bins") that contain information received by the selective call receiver. The inverse highlighted filled triangle 303 represents the position of the active message pointer.

The function indicators 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, are arranged in a menu format below the message slot display lines. These function indicators represent actions which can be performed on information within the selective call receiver. The indicators are grouped by function into read and status modes. The read mode function indicators 308, 309, 310, 311, 312, 313 are used to control the disposition of messages received by the selective call receiver. In this embodiment, read mode function indicators include message locking 309, message addition 310, message deletion 311, print message 312, and print all messages 313. The status mode function indicators 304, 305, 306, 307, 308, are used to access and alter operational parameters associated with intrinsic functions within the selective call receiver. In this embodiment, status mode function indicators include alert selection 304, clock configuration 305, alarm configuration 306, and speaker control 307. The home function indicator 308 is shared by both the read and status modes.

I claim:

5,157,391

3

1. A method of presenting a plurality of function indicators in a selective call receiver capable of receiving a message, the method comprising the steps of:

in a message read mode:

displaying a first set of said plurality of function indicators associated with said message read mode and said message; and

in a selective call receiver status mode:

displaying a second set of said plurality of function indicators associated with said selective call receiver status mode.

2. A method for displaying a plurality of function indicators on a display of a selective call receiver capable of receiving and presenting a message, said method comprising the steps of:

in a message read mode:

determining at least one active indicator from a first set of said plurality of function indicators by examining characteristics associated with said message;

displaying said at least one active indicator; and

in selective call receiver status mode:

displaying a second set of said plurality of function indicators associated with the characteristics of said selective call receiver.

3. The method according to claim 2 wherein said determining step comprises the step of comparing information associated with each of said messages to uniquely associate specific operations and their corresponding function indicators within said first set of said plurality of function indicators with each of said messages.

4. The method according to claim 3 wherein said selective call receiver includes an information storage medium and said method executes at least one of the steps of:

reading at least one received message by presenting the received message on the display;

printing at least one received message;

deleting at least one received message from the information storage medium;

adding at least one received message to a different message slot within the information storage medium; and

locking at least one received message to prevent deletion from the information storage medium.

4

5. An apparatus for presenting a plurality of function indicators in a selective call receiver capable of receiving a message, comprising:

in a message read mode:

first means for displaying a first set of said plurality of function indicators associated with said message read mode and said message; and

in a selective call receiver status mode:

second means for displaying a second set of said plurality of function indicators associated with said selective call receiver status mode.

6. An apparatus for displaying a plurality of function indicators on a display of a selective call receiver capable of receiving and presenting a message, said apparatus comprising:

in a message read mode of operation:

first means for determining at least one active indicator from a first set of said plurality of function indicators by examining characteristics associated with said message;

second means for displaying said at least one active indicator; and

in a selective call receiver status mode of operation:

third means for displaying a second set of said plurality of function indicators associated with the characteristics of said selective call receiver.

7. The apparatus according to claim 6 wherein said first means comprises comparing information associated with each of said messages to uniquely associate specific operations and their corresponding function indicators within said first set of said plurality of function indicators with each of said messages.

8. An apparatus for displaying a function menu including a plurality of function indicators on a display of a selective call receiver of the type which receives messages and presents messages, said method comprising:

means for displaying only those of said function indicators which may be selected; and

means for performing an operation associated with one of said plurality of function indicators when said function indicator is selected.

9. The apparatus according to claim 8 wherein said selective call receiver includes an information storage medium and wherein said means for performing comprises means for reading, writing, deleting, and moving information within said information storage medium.

* * * * *

50

55

60

65

2

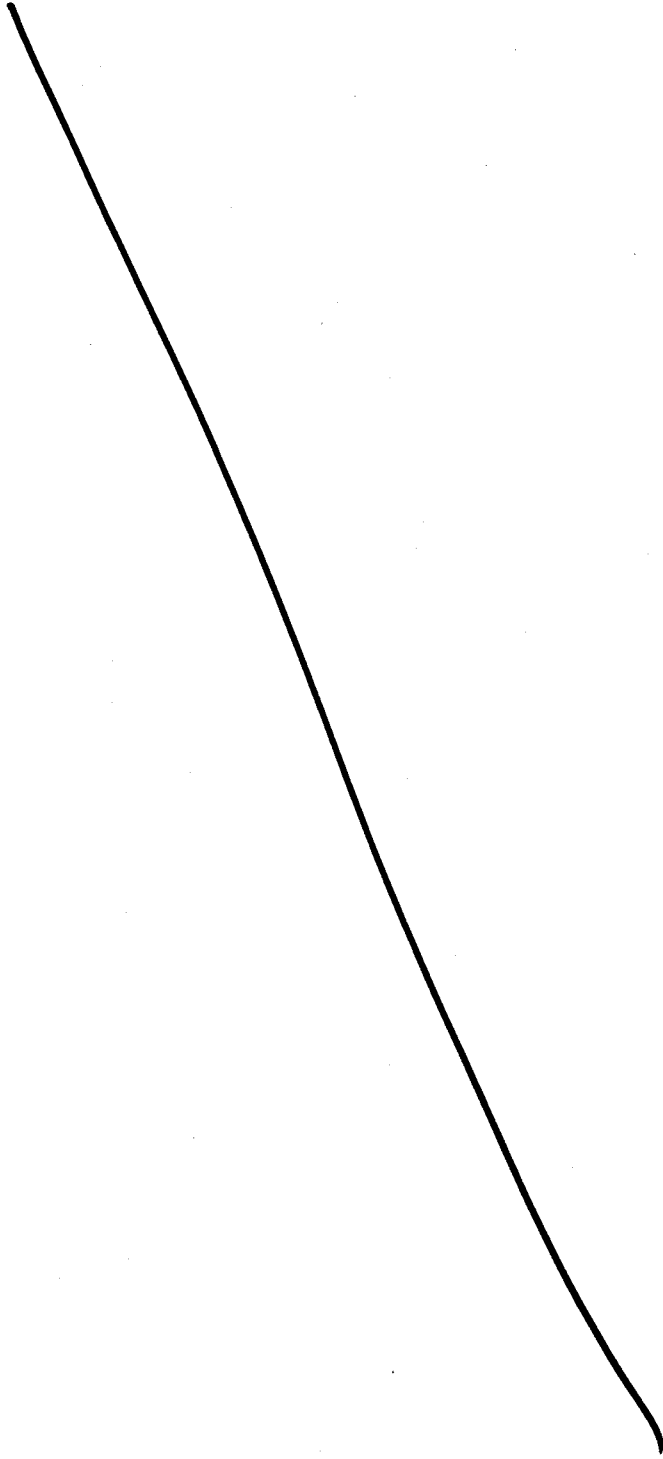
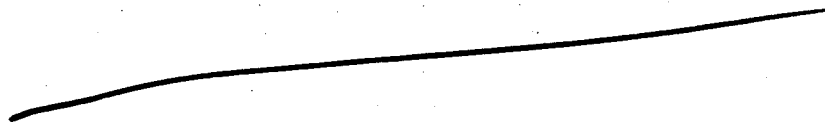


Exhibit 2

A single, slightly curved horizontal line, possibly a signature or a decorative element, located at the bottom of the page.



US005394140A

United States Patent [19]

Wong et al.

[11] Patent Number: 5,394,140

[45] Date of Patent: Feb. 28, 1995

[54] METHOD AND APPARATUS FOR
PRE-PROGRAMMED
CALL-BACK-NUMBER-DETERMINED
ALERT

[75] Inventors: Poh-T'in Wong, Boynton Beach;
Allen J. Weidler, Lake Worth;
William J. Burke, Boca Raton, all of
Fla.

[73] Assignee: Motorola, Inc., Schaumburg, Ill.

[21] Appl. No.: 980,047

[22] Filed: Nov. 23, 1992

[51] Int. Cl.⁶ G08B 5/22
[52] U.S. Cl. 340/825.44; 340/825.22
[58] Field of Search 340/825.44, 825.45,
340/825.46, 825.48, 311.1, 825.22; 364/705.05,
715.11; 455/38.1, 38.2, 38.5

[56] References Cited

U.S. PATENT DOCUMENTS

H1,173 4/1993 Davis et al. 340/825.44
4,758,834 7/1988 Sato et al. .
4,868,561 9/1989 Davis .

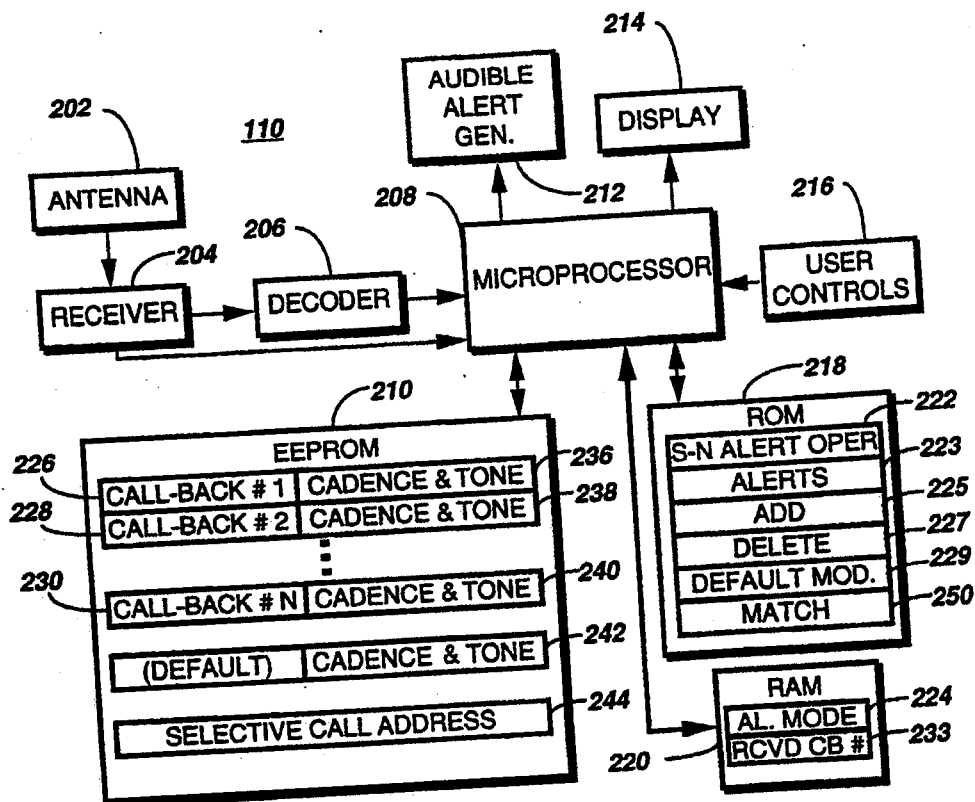
4,922,221 5/1990 Sato et al. .
4,994,797 2/1991 Breedon .
5,043,721 8/1991 May 364/705.05
5,122,778 6/1992 Erhart et al. 364/715.11

Primary Examiner—Michael Horabik
Attorney, Agent, or Firm—R. Louis Breedon

ABSTRACT

A method and apparatus in a communication receiver (110) for controlling an alert in response to a received call-back number (233) include receiving (402) the call-back number (233). A processor (208) in the communication receiver (110) compares (406) the received call-back number (233) with a list of pre-programmed call-back numbers (226, 228, 230) stored in a memory (210). If the received call-back number (233) matches (408) one of the pre-programmed call-back numbers (226, 228, 230), the processor (208) selects (410) a pre-programmed alert (236, 238, 240) corresponding to the matched pre-programmed call-back number (233), and instructs (414) an alert generator (212) to generate the selected pre-programmed alert (236, 238, 240).

20 Claims, 6 Drawing Sheets



U.S. Patent

Feb. 28, 1995

Sheet 1 of 6

5,394,140

FIG. 1

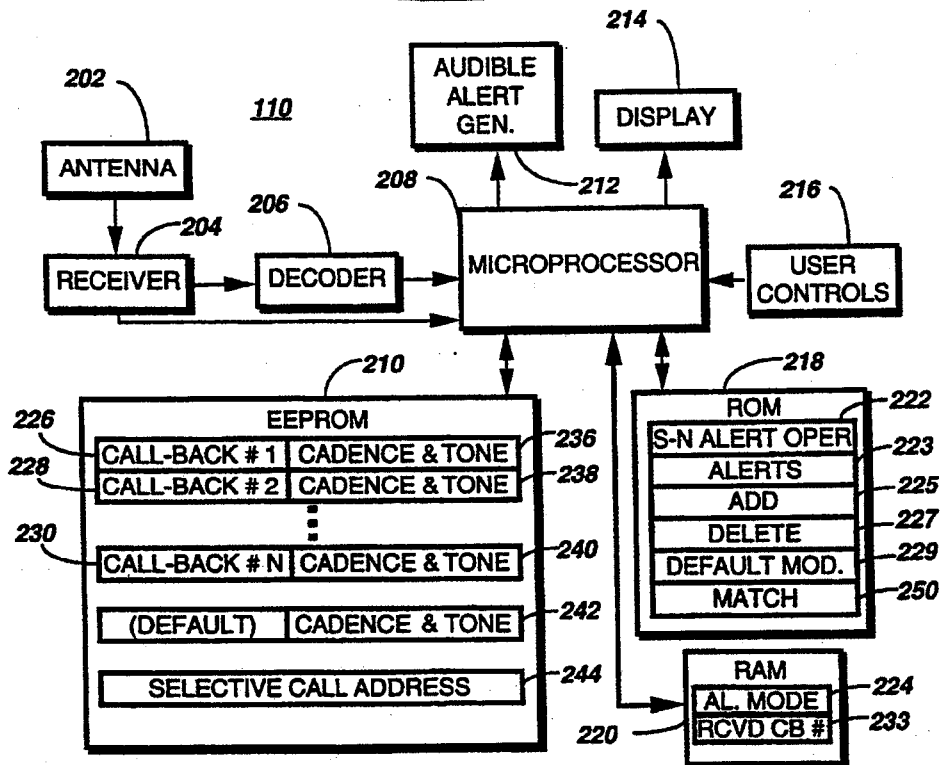
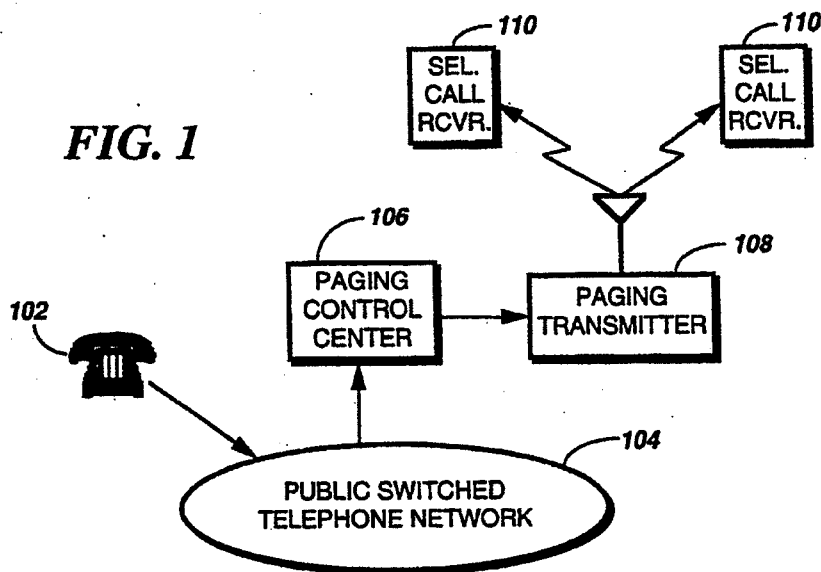


FIG. 2

U.S. Patent

Feb. 28, 1995

Sheet 2 of 6

5,394,140

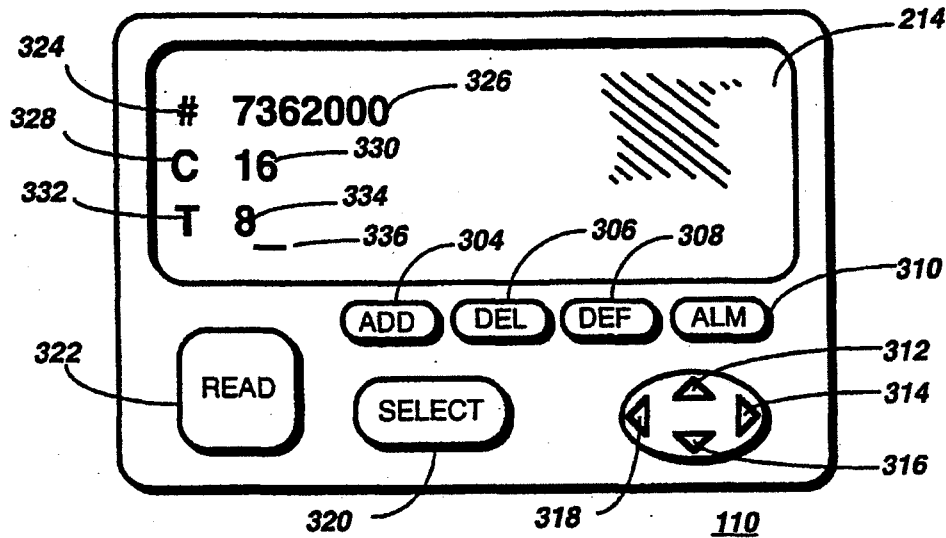


FIG. 3

802

USER DEPRESSES
ALM BUTTON

804

MICROPROCESSOR (MP)
ACCESSES ROM TO
EXECUTE S-N ALERT
OPER. FIRMWARE

806

MP ACCESSES RAM TO
DETERMINE PRESENT
ALERT MODE

808

MP TOGGLES TO
OPPOSITE ALERT
MODE

810

END

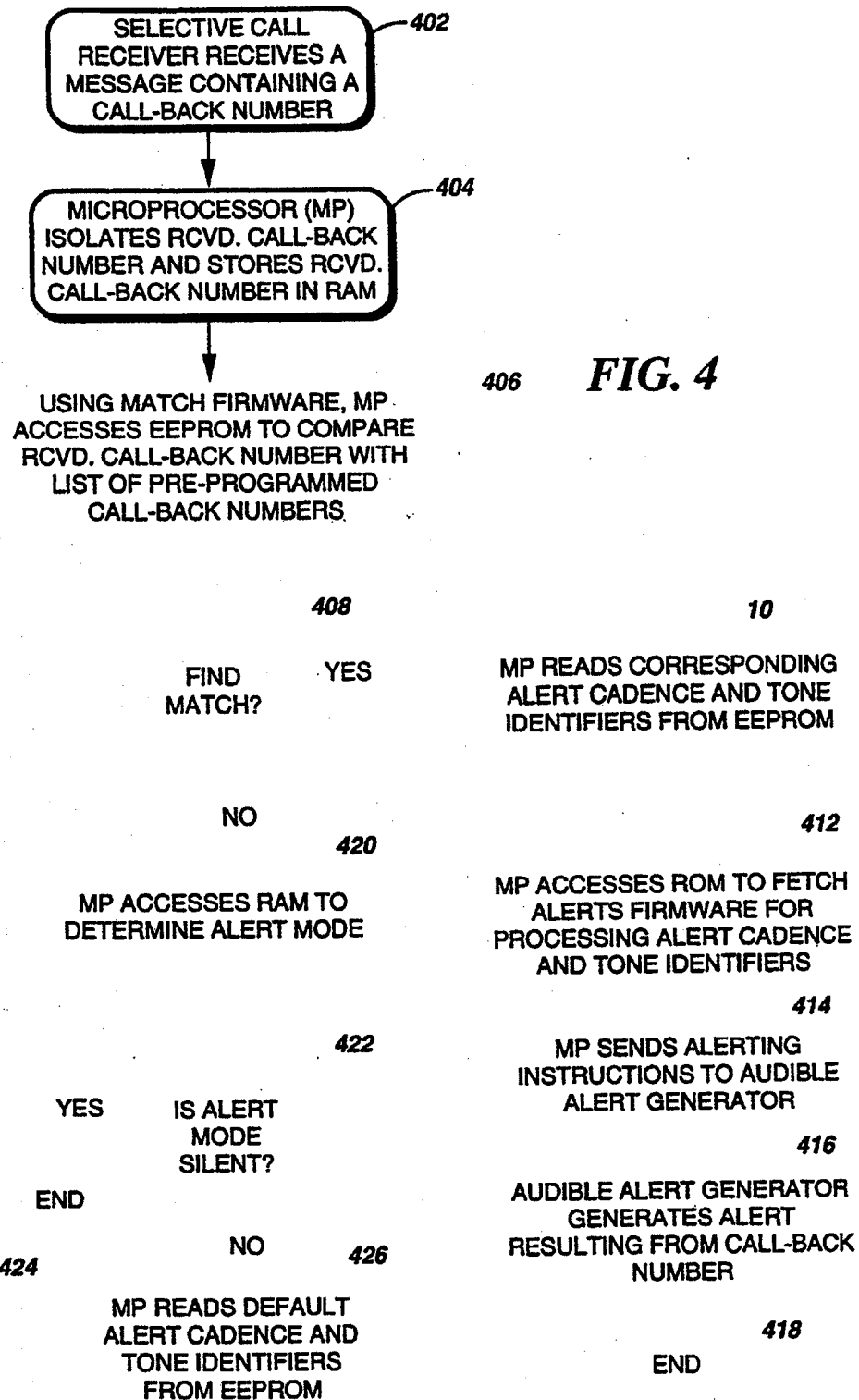
FIG. 8

U.S. Patent

Feb. 28, 1995

Sheet 3 of 6

5,394,140

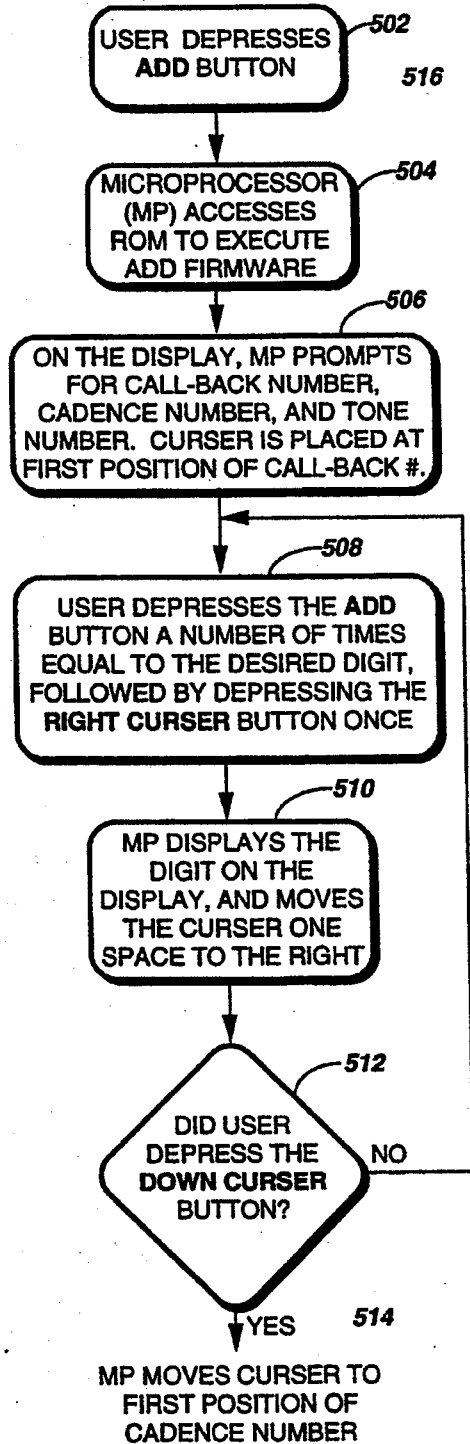


U.S. Patent

Feb. 28, 1995

Sheet 4 of 6

5,394,140



USER DEPRESSES THE ADD BUTTON A NUMBER OF TIMES EQUAL TO THE DESIRED DIGIT, FOLLOWED BY DEPRESSING THE RIGHT CURSER BUTTON ONCE

518

MP DISPLAYS THE DIGIT ON THE DISPLAY, AND MOVES THE CURSER ONE SPACE TO THE RIGHT

520

DID USER DEPRESS THE DOWN CURSER CONTROL BUTTON? NO

YES 522

MP MOVES CURSER TO ONLY POSITION OF TONE NUMBER

524

USER DEPRESSES THE ADD BUTTON A NUMBER OF TIMES EQUAL TO THE DESIRED DIGIT, FOLLOWED BY DEPRESSING THE RIGHT CURSER BUTTON ONCE

526

MP DISPLAYS THE DIGIT ON THE DISPLAY, AND STORES THE NEW ENTRY IN EEPROM

528

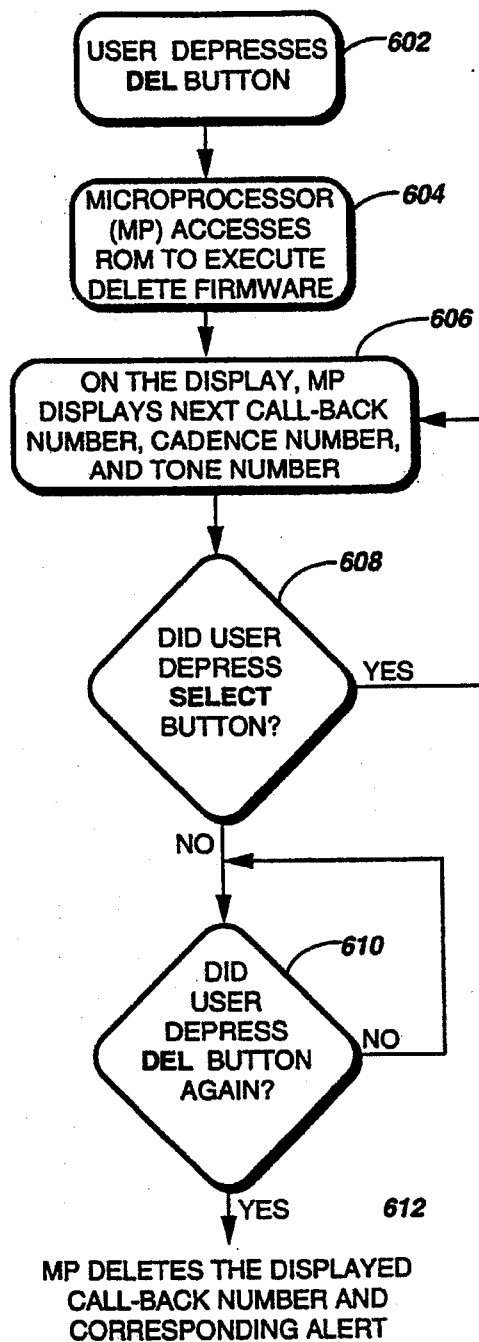
END **FIG. 5**

U.S. Patent

Feb. 28, 1995

Sheet 5 of 6

5,394,140



14

END

FIG. 6

U.S. Patent

Feb. 28, 1995

Sheet 6 of 6

5,394,140

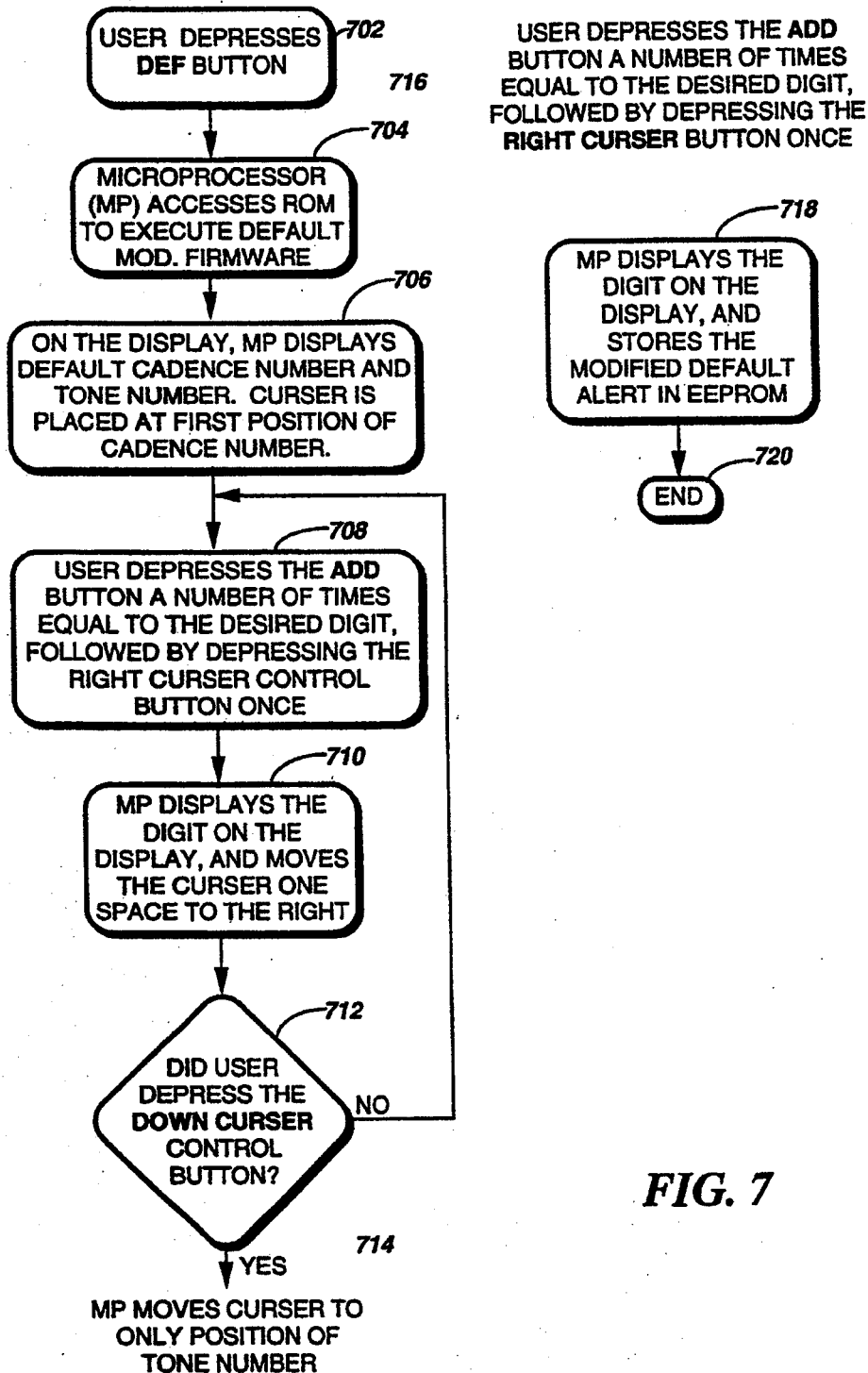


FIG. 7

5,394,140

1

METHOD AND APPARATUS FOR PRE-PROGRAMMED CALL-BACK-NUMBER-DETERMINED ALERT

FIELD OF THE INVENTION

This invention relates in general to communication receivers, and more specifically to a method and apparatus in a communication receiver for generating a pre-programmed special alert in response to receiving a call-back number that matches a pre-programmed number.

BACKGROUND OF THE INVENTION

Radio pagers (also known as selective call receivers) having a plurality of alerts are well known. It was common before numeric display pagers became available for a radio pager to have a plurality of predetermined selective call addresses, each associated with a telephone access number that could be dialed by callers to send pages to the associated selective call address. Typically, an indication, e.g., a unique alert tone or alert cadence, was generated in response to receiving a page directed to the selective call address. By partitioning potential callers into several different groups, each given a different telephone access number to call, a user could attain some degree of knowledge of the source of the call. For example, a user could give a first telephone access number to business associates, a second number to friends, a third number to relatives, etc. By noting the unique alert accompanying a page, a user was able to discern which telephone access number was dialed to send the page, and thus which of the groups of callers probably originated the page. A significant drawback to this approach of call source identification is that assigning multiple telephone access numbers to a pager is expensive. Another drawback resulted from the limited number of unique addresses and corresponding telephone access numbers possible for each pager.

The arrival of the numeric display pager significantly reduced the need to partition callers into separate groups dialing separate telephone access numbers. By utilizing numeric display paging, callers could dial a single telephone access number to send a call-back number (entered by the caller using, for example, a tone dialing telephone set) that the page recipient could then call to contact the caller by telephone. In many instances the page recipient could discern the identity of a familiar caller by recognizing a familiar call-back number, e.g., the number of the page recipient's home or office, or that of an important client. This ability largely eliminated the need for the expensive multiple telephone access number approach of source identification.

Still, there are situations that can impair one's ability to discern the identity of even an important caller from a displayed call-back number. For example, the call-back number might be that of a relatively new business associate and not yet committed to the page recipient's memory, or perhaps the display might be poorly lighted, making it difficult to read.

Thus, what is needed is a way to aid a user in discerning that a call is from a predetermined subset of important callers without the user's having to memorize call-back numbers or having to read a poorly lighted displayed number. A way is needed that does not require

2

expensive multiple telephone access numbers for a single pager.

SUMMARY OF THE INVENTION

5 An aspect of the present invention is a communication receiver comprising a receiver element for receiving a message comprising at least a received call-back number, and a storage element for storing at least one user-programmed call-back number along with data defining at least one corresponding user-programmed special audible alert, and further for storing data defining a user-programmed default audible alert. The communication receiver further comprises a processor coupled to the receiver element for processing the message to derive the received call-back number and coupled to the storage element for comparing the received call-back number with the at least one user-programmed call-back number. The communication receiver also includes an audible alert generation element coupled to the processor for generating, in response to the received call-back number being found equal to a call-back number included in the at least one user-programmed call-back number, the corresponding user-programmed special audible alert in accordance with the data defining said alert. The processor comprises a first processor element for controlling the audible alert generation element to generate the user-programmed default audible alert in response to the received call-back number being found not equal to any call-back number included in the at least one user-programmed call back number.

Another aspect of the present invention is a selective call receiver comprising a receiver for receiving information comprising an address and a message containing at least a received call-back number, and a decoder coupled to the receiver for decoding the received address. The selective call receiver further comprises a memory element for storing at least one user-programmed call-back number and data defining at least one corresponding user-programmed special audible alert, and further for storing data defining a user-programmed default audible alert. The selective call receiver also includes a processor responsive to the decoder and coupled to the receiver for processing the received message to derive the received call-back number, the processor also coupled to the memory element for comparing the received call-back number with the at least one user-programmed call-back number. In addition, the selective call receiver includes a display coupled to the processor for displaying the received message, and an audible alert generator coupled to the processor for generating, in response to the received call-back number being found equal to a call-back number included in the at least one user-programmed call-back number, the corresponding user-programmed special audible alert in accordance with the data defining the alert. The processor comprises a first processor element for controlling the audible alert generator to generate the user-programmed default audible alert in response to the received call-back number being found not equal to any call-back number included in the at least one user-programmed call back number.

Another aspect of the present invention is a method in a communication receiver for controlling an audible alert in response to a received call-back number, the method comprising the steps of (a) receiving a message comprising at least the received call-back number, and (b) comparing the received call-back number with at least one user-programmed call-back number. The

5,394,140

3

method further comprises the steps of (c) selecting a user-programmed special audible alert corresponding to the received call-back number in response to determining in step (b) that the received call-back number is equal to a call-back number included in the at least one user-programmed call-back number, and (d) selecting a user-programmed default audible alert in response to determining in step (b) that the received call-back number is not equal to any call-back number included in the at least one user-programmed call-back number. The method further comprises the step of (e) generating the user-programmed audible alert selected in accordance with steps (c) and (d).

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an electrical block diagram of a communication system in accordance with the preferred embodiment of the present invention.

FIG. 2 is an electrical block diagram of a selective call receiver in accordance with the preferred embodiment of the present invention.

FIG. 3 is an orthographic front view of a selective call receiver in accordance with the preferred embodiment of the present invention.

FIG. 4 is a flow chart of a method in the selective call receiver for alert control responsive to a received call-back number in accordance with the preferred embodiment of the present invention.

FIG. 5 is a flow chart of a method in the selective call receiver for adding a new call-back number and corresponding special alert in accordance with the preferred embodiment of the present invention.

FIG. 6 is a flow chart of a method in the selective call receiver for deleting a call-back number and corresponding special alert in accordance with the preferred embodiment of the present invention.

FIG. 7 is a flow chart of a method in the selective call receiver for modifying a default alert in accordance with the preferred embodiment of the present invention.

FIG. 8 is a flow chart of a method in the selective call receiver for toggling an alert mode in accordance with the preferred embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, an electrical block diagram of a communication system in accordance with the preferred embodiment of the present invention depicts a telephone 102 coupled through the Public Switched Telephone Network (PSTN) 104 to a paging control center 106. The paging control center 106 is coupled to a paging transmitter 108, which transmits selective call messages by radio signals to a selective call receiver 110 preferably having display capability for displaying a call-back number. In operation, a caller desiring to contact a user of a selective call receiver 110 uses the telephone 102 to place a call through the PSTN 104 by dialing a paging access number assigned to an address of the selective call receiver 110. Upon receiving the call, the paging control center 106 prompts the caller to enter a call-back number using tone dialing buttons of the telephone 102, after which the paging control center 106 sends the address of the called selective call receiver 110 and the call-back number to the paging transmitter 108. In response, the paging transmitter 108 transmits over the air the address along with the call-back number, preferably using a standard radio paging

4

protocol such as the Post Office Code Standardization Advisory Group (POCSAG) protocol, although it will be appreciated that other signaling protocols can be utilized as well.

After receiving the address and upon recognizing that the address matches an address of the selective call receiver 110, the selective call receiver 110 generates an alert, and then in response to an action by a user of the selective call receiver 110, e.g., a button push, displays the call-back number. The user then finds a telephone and places a call to the call-back number to converse with the caller. Additionally, in accordance with the preferred embodiment of the present invention, upon receipt of the call-back number the selective call receiver 110 accesses a list of pre-programmed call-back numbers 226, 228, 230 (FIG. 2) and corresponding special alerts 236, 238, 240 (FIG. 2), as is described in detail herein below. Then, if the received call-back number matches one of the pre-programmed call-back numbers 226, 228, 230, the selective call receiver 110 generates one of the corresponding special alerts 236, 238, 240.

Referring to FIG. 2, an electrical block diagram of the selective call receiver 110 in accordance with the preferred embodiment of the present invention comprises an antenna 202 for intercepting the radio signals transmitted by the paging transmitter 108 (FIG. 1). The antenna 202 is coupled to a receiver 204 for demodulating the intercepted radio signals to derive address and message information comprising at least a call-back number. The receiver 204 is coupled to a decoder 206 for decoding the address information, and to a microprocessor 208 for processing the message information. The microprocessor 208 is coupled to an audible alert generator 212 for generating an audible alert in response to instructions from the processor after receipt of a message. The microprocessor 208 is also coupled to a display 214, such as a liquid crystal display, for displaying the received message. The microprocessor 208 is also coupled to user controls 216, such as well-known buttons and switches, for allowing a user to control operation of the selective call receiver 110.

In addition, the microprocessor 208 is coupled to an electrically erasable programmable read only memory (EEPROM) 210, a read only memory (ROM) 218, and a random access memory (RAM) 220 for storing pre-programmed values, operating firmware, and temporarily needed values, respectively. The EEPROM 210 comprises values for the pre-programmed call-back numbers 226, 228, 230 and the corresponding special alerts 236, 238, 240 comprising values for both alert cadence and alert tone frequency. Also included in the EEPROM 210 are alert cadence and alert tone frequency values for a default alert 242 associated with a default call-back number, i.e., a received call-back number that does not match any of the pre-programmed call-back numbers 226, 228, 230. In addition, the EEPROM 210 stores values for at least one pre-programmed selective call address 244 to which the selective call receiver is responsive.

The ROM 218 comprises Silent and Non-silent Alert Operation firmware 222 for controlling alerting of the selective call receiver 110 according to a silent or non-silent alert mode selected by the user. Also included is Alerts firmware 223 for controlling the audible alert generator 212 in accordance with the pre-programmed special alerts 236, 238, 240 and default alert 242. In addition, Add, Delete, and Default Modify firmware 225, 227, and 229 are provided for adding a new mem-

5,394,140

5

ber of the pre-programmed call-back numbers 226, 228, 230 and corresponding special alerts 236, 238, 240, and for modifying the default alert 242. Also included is Match firmware 250 for comparing a received call-back number with the pre-programmed call-back numbers 226, 228, 230.

The RAM 220 is utilized by the microprocessor 208 for temporary storage of operational values, such as timer values, counters, received information, etc., in RAM locations in a manner well known in the art of stored program processing systems. One such location is an Alert Mode location 224 for storing the alert mode, i.e., silent or non-silent alert mode, last selected by the user. Another such location is a received call-back number location 233 for storing a received call-back number.

Referring to FIG. 3, an orthographic front view of the selective call receiver 110 in accordance with the preferred embodiment of the present invention depicts the display 214 as it would appear during a procedure for adding a new member to the pre-programmed call-back numbers 226, 228, 230 and corresponding special alerts 236, 238, 240 (FIG. 2). Also depicted are members of the user controls 216 (FIG. 2) comprising an ADD button 304 for adding a new member to the pre-programmed call-back numbers 226, 228, 230 and corresponding special alerts 236, 238, 240, and a DEL button 306 for deleting one of the pre-programmed call-back numbers 226, 228, 230 and corresponding special alerts 236, 238, 240. A DEF button 308 is for modifying the default alert 242 (FIG. 2), while an ALM button 310 is provided for toggling between silent and non-silent alert modes. Movement of a cursor 336 on the display 214 is controlled by an UP CURSOR button 312, a RIGHT CURSOR button 314, a DOWN CURSOR button 316, and a LEFT CURSOR button 318. In addition, there is a SELECT button 320 for selecting a displayed item, as described herein below, and a READ button 322 for reading a selected received message. Operation of the user controls 214 in accordance with the preferred embodiment of the present invention is more fully described herein below in the detailed description of FIGS. 5, 6, 7, and 8.

On the display 214 are a call-back number prompt 324 and an entered call-back number 326 entered by the user. A cadence prompt 328 is also on the display, followed by a cadence identifier 330 selected by the user. In addition, the display shows a tone frequency prompt 332 and a tone frequency identifier 334 selected by the user.

Referring to FIG. 4, a flow chart of a method in the selective call receiver 110 (FIG. 2) for alert control responsive to a received call-back number in accordance with the preferred embodiment of the present invention begins with the selective call receiver 110 receiving 402 a message containing a call-back number. The microprocessor 208 (FIG. 2) of the selective call receiver 110 isolates 404 the received call-back number and stores it temporarily in the received call-back number location 233 in the RAM 220 (FIG. 2). Next, using the Match firmware 250 (FIG. 2), the microprocessor 208 accesses 406 the EEPROM 210 (FIG. 2) to compare the received call-back number with the pre-programmed call-back numbers 226, 228, 230 to see if any of the pre-programmed call-back numbers 226, 228, 230 match the received call-back number. If in step 408 a match is found, then the microprocessor 208 reads 410 from the EEPROM 210 the corresponding one of the

6

special alerts 236, 238, 240 (FIG. 2) comprising alert cadence and tone frequency identifiers. Using the Alerts firmware 223 (FIG. 2), the microprocessor 208 processes 412 the alert cadence and tone frequency identifiers to determine alerting instructions. Next, the microprocessor 208 sends 414 the alerting instructions to the audible alert generator 212 (FIG. 2). In response, the audible alert generator 212 generates 416 an alert corresponding to the one of the special alert 236, 238, 240 pre-programmed for the matched received call-back number, and the process ends 418. Programmable audible alert generators, such as the audible alert generator 212, are well known in the art. U.S. Pat. No. 4,868,561 issued Sep. 19, 1989 to Davis, which describes a programmable audible alert generator, is hereby incorporated by reference herein.

If, on the other hand, in step 408 the microprocessor 208 (FIG. 2) does not find a match to the received call-back number, then the microprocessor 208 accesses 420 the Alert Mode location 224 in the RAM 220 to determine the alert mode. If in step 422 the microprocessor 208 finds that the alert mode is silent, then the process ends 424. If in step 422 the microprocessor 208 finds that the alert mode is non-silent, then the microprocessor 208 reads 426 the default alert 242 (FIG. 2) from the EEPROM 210 and sends the cadence and tone frequency identifiers to step 412 as before, ultimately resulting in generation of an alert corresponding to the default alert 242.

Referring to FIG. 5, a flow chart of a method in the selective call receiver 110 (FIG. 2) for adding a new call-back number and corresponding special alert in accordance with the preferred embodiment of the present invention begins with a user depressing 502 the ADD button 304 (FIG. 3). In response, the microprocessor 208 (FIG. 2) accesses 504 the ROM 218 to execute the Add firmware 225 (FIG. 2). Next, the microprocessor 208 instructs 506 the display 214 (FIG. 3) to generate the call-back number prompt 324, the cadence prompt 328, and the tone frequency prompt 332 (FIG. 3), while placing the cursor 336 at a first position for entry of the new call-back number. To enter the first digit of the new call-back number, the user depresses 508 the ADD button 304 a number of times equal to the desired digit, e.g., no times for the digit zero or six times for the digit six, followed by depressing the RIGHT CURSOR button 314 (FIG. 3) once to move to the next digit. While not shown in the flow chart of FIG. 5, the user also may depress the DEL button 306 (FIG. 3) to reduce the value of a digit at the position of the cursor 336 by a count of one, e.g., to correct an overcount. Concurrent with the depression of the ADD (or DEL) button 304, 306 the microprocessor 208 displays 510 the resultant digit on the display 214, and after the depression of the RIGHT CURSOR button 314, moves the cursor 336 one position to the right. If in step 512 the user has not additionally depressed the DOWN CURSOR button 316 (FIG. 3), then flow returns to step 508 for entry of the next digit of the new call-back number.

If, on the other hand, in step 512 the user has depressed the DOWN CURSOR button 316 (FIG. 3), then the microprocessor 208 (FIG. 2) moves 514 the cursor 336 (FIG. 3) to a first position for entry of a cadence identifier number. As before, the user depresses 516 the ADD (or DEL) button 304, 306 (FIG. 3) a number of times to reach the desired digit, followed by depressing the RIGHT CURSOR button 314 (FIG. 3) to move to the next digit position. Also as before, con-

5,394,140

7

current with the depression of the ADD (or DEL) button 304, 306 the microprocessor 208 displays 518 the resultant digit on the display 214 (FIG. 3), and after the depression of the RIGHT CURSOR button 314, moves the cursor 336 one position to the right. If in step 520 the user has not additionally depressed the DOWN CURSOR button 316, then flow returns to step 516 for entry of the next digit of the cadence identifier number.

If, on the other hand, in step 520 the user has depressed the DOWN CURSOR button 316 (FIG. 3), then the microprocessor 208 (FIG. 2) moves 522 the cursor 336 (FIG. 3) to the single position for entry of a tone frequency identifier number. Next, the user depresses 524 the ADD (or DEL) button 304, 306 (FIG. 3) a number of times to reach the desired digit, followed by depressing the RIGHT CURSOR button 314 (FIG. 3) once. In response, the microprocessor 208 displays 526 the digit on the display 214 (FIG. 3) and stores the new call-back number and corresponding special alert along with the other pre-programmed call-back numbers 226, 228, 230 and corresponding special alerts 236, 238, 240 in the EEPROM 210 (FIG. 2). At step 528, the process ends.

Referring to FIG. 6, a flow chart of a method in the selective call receiver 110 (FIG. 2) for deleting one of the call-back numbers 226, 228, 230 (FIG. 2) and corresponding special alerts 236, 238, 240 (FIG. 2) in accordance with the preferred embodiment of the present invention begins with the user depressing the DEL button 306 (FIG. 3). In response, the microprocessor 208 (FIG. 2) accesses 604 the ROE 218 to execute the Delete firmware 227. On the display 214 (FIG. 3) the microprocessor 208 displays 606 the first one of the pre-programmed call-back numbers 226, 228, 230, along with an alert descriptor of the corresponding one of the special alerts 236, 238, 240, the alert descriptor comprising a cadence identifier number and a tone frequency identifier number. If in step 608 the user depresses the SELECT button 320 (FIG. 3), then the flow returns to step 606 to display the next one of the pre-programmed call-back numbers 226, 228, 230 and corresponding alert descriptor, and so on, until the user finds one of the call-back numbers 226, 228, 230 that the user desires to delete. When in step 608 the user has not depressed the SELECT button 320, but instead has again pressed the DEL button 306, then from step 610 flow advances to step 612, where the microprocessor 208 deletes the currently displayed one of the call-back numbers 226, 228, 230 and corresponding one of the special alerts 236, 238, 240, after which the process ends 614.

Referring to FIG. 7, a flow chart of a method in the selective call receiver 110 (FIG. 2) for modifying the default alert 242 (FIG. 2) in accordance with the preferred embodiment of the present invention begins with the user depressing 702 the DEF button 308 (FIG. 3). In response, the microprocessor 208 (FIG. 2) accesses 704 the ROM 218 (FIG. 2) to execute the Default Modify firmware 229 (FIG. 2). On the display 214 (FIG. 3) the microprocessor 208 displays 706 the currently programmed default cadence identifier number and default tone frequency identifier number. The cursor 336 (FIG. 3) is placed at the first position for entry of the cadence identifier number. As before, the user depresses 708 the ADD (or DEL) button 304, 306 (FIG. 3) a number of times to reach the desired digit, followed by depressing the RIGHT CURSOR button 314 (FIG. 3) to move to the next digit position. If the user does not wish to change a displayed digit at the cursor position, the user

8

may depress the RIGHT CURSOR button 314 without depressing the ADD (or DEL) button 304, 306. Also as before, concurrent with the depression of the ADD (or DEL) button 304, 306 (FIG. 3) the microprocessor 208 displays 710 the resultant digit on the display 214 (FIG. 3), and after the depression of the RIGHT CURSOR button 314, moves the cursor 336 one position to the right. If in step 712 the user has not additionally depressed the DOWN CURSOR button 316 (FIG. 3), then flow returns to step 708 for entry of the next digit of the cadence identifier number.

If, on the other hand, in step 712 the user has depressed the DOWN CURSOR button 316 (FIG. 3), then the microprocessor 208 (FIG. 2) moves 714 the cursor 336 (FIG. 3) to the single position for entry of a tone frequency identifier number. Next, the user depresses 716 the ADD (or DEL) button 304, 306 (FIG. 3) a number of times to reach the desired digit, followed by depressing the RIGHT CURSOR button 314 (FIG. 3) once. If the user does not wish to change the displayed digit at the cursor position, the user may depress the RIGHT CURSOR button 314 without depressing the ADD (or DEL) button 304, 306. In response, the microprocessor 208 displays 718 the digit on the display 214 (FIG. 3) and writes the newly entered values into the location in the EEPROM 210 (FIG. 2) for the modified default alert 242 (FIG. 2), after which the process ends 720.

Referring to FIG. 8, a flow chart of a method in the selective call receiver 110 (FIG. 2) for toggling the alert mode 224 (FIG. 2) in accordance with the preferred embodiment of the present invention begins with the user depressing 802 the ALM button 310 (FIG. 3). In response, the microprocessor 208 (FIG. 2) accesses the ROM 218 (FIG. 2) to execute the Silent and Non-silent Alert Operation firmware 222 (FIG. 2). Next, the microprocessor 208 accesses 806 the Alert Mode location 224 in the RAM 220 (FIG. 2) to determine the current alert mode, and then toggles 808 the alert mode to the mode opposite the current mode, e.g., to the silent alert mode if the current alert mode is non-silent, and vice versa, after which the process ends 810.

It will be appreciated that different user controls and different user control operation may be substituted for the user controls and user control operation described herein above for the preferred embodiment without departing from the intent of the present invention. For example, a displayed menu and a cursor could be used instead of direct buttons to access functions such as Add, Delete, etc., in a manner well known in the art. For another example, a full numeric keypad could be used to enter information such as call-back number, cadence number, etc., instead of multiple depressions of a single button to count up or down to a digit value.

Thus, the present invention provides a way of helping a user discern that a call is from a predetermined important caller or group of important callers without the user's having to memorize call-back numbers or having to read a poorly lighted displayed number. The present invention advantageously enables the user to pre-program a selective call receiver such that the selective call receiver generates a recognizable, unique, audible alert in response to receiving a call-back number that the user considers important. The present invention advantageously eliminates the need to use expensive multiple telephone access numbers for a single pager in order to provide audibly distinct alerts.

We claim:

5,394,140

9

1. A communication receiver comprising:
 receiver means for receiving a message comprising at
 least a received call-back number;
 storage means for storing at least one user-pro-
 grammed call-back number along with data defin- 5
 ing at least one corresponding user-programmed
 special audible alert, and further for storing data
 defining a user-programmed default audible alert;
 processor means coupled to the receiver means for
 processing the message to derive the received call- 10
 back number and coupled to the storage means for
 comparing the received call-back number with the
 at least one user-programmed call-back number;
 and
 audible alert generation means coupled to the proces- 15
 sor means for generating, in response to the re-
 ceived call-back number being found equal to a
 call-back number included in the at least one user-
 programmed call-back number, the corresponding
 user-programmed special audible alert in accor- 20
 dance with the data defining said alert,
 wherein the processor means comprises a first proces-
 sor element for controlling the audible alert gener-
 ation means to generate the user-programmed def- 25
 ault audible alert in response to the received call-
 back number being found not equal to any call-
 back number included in the at least one user-pro-
 grammed call back number.

2. The communication receiver in accordance with 30
 claim 1, further comprising user control means coupled
 to the processor means and to the storage means for
 allowing a user to add or delete a user-programmed
 call-back number and a corresponding user-pro-
 grammed special audible alert.

3. The communication receiver in accordance with 35
 claim 1, wherein the storage means comprises a non-
 volatile memory.

4. The communication receiver in accordance with 40
 claim 1, further comprising user control means coupled
 to the processor means for allowing a user to modify the
 user-programmed default audible alert.

5. The communication receiver in accordance with 45
 claim 4, further comprising a second processor element
 coupled to the processor means and responsive to the
 user control means for controlling the generation of the
 user-programmed default audible alert,
 wherein the second processor element disallows gener-
 ation of the user-programmed default audible 50
 alert but allows generation of the user-pro-
 grammed special audible alert in response to user
 selection of a first alert mode, and
 wherein the second processor element allows genera-
 tion of both the user-programmed default audible
 alert and the user-programmed special audible alert 55
 in response to user selection of a second alert mode.

6. The communication receiver in accordance with
 claim 2, wherein the user control means comprises:
 means for a user to select a cadence for a new user-
 programmed special audible alert; and
 means for a user to select a tone frequency for the 60
 new user-programmed special audible alert, and
 wherein the audible alert generation means generates
 the new user-programmed special audible alert in
 accordance with the selected cadence and tone 65
 frequency.

7. The communication receiver in accordance with
 claim 4, wherein the user control means comprises:

10

means for a user to select a cadence for the user-pro-
 grammed default audible alert; and
 means for a user to select a tone frequency for the
 user-programmed default audible alert, and
 wherein the audible alert generation means generates
 the user-programmed default audible alert in accor-
 dance with the selected cadence and tone fre-
 quency.

8. (Amended) A selective call receiver comprising:
 a receiver for receiving information comprising an
 address and a message containing at least a re-
 ceived call-back number;
 a decoder coupled to the receiver for decoding the
 received address;
 a memory element for storing at least one user-pro-
 grammed call-back number and data defining at
 least one corresponding user-programmed special
 audible alert, and further for storing data defining a
 user-programmed default audible alert;
 a processor responsive to the decoder and coupled to
 the receiver for processing the received message to
 derive the received call-back number, the proces-
 sor also coupled to the memory element for compar-
 ing the received call-back number with the at
 least one user-programmed call-back number;
 a display coupled to the processor for displaying the
 received message; and
 an audible alert generator coupled to the processor
 for generating, in response to the received call-
 back number being found equal to a call-back num-
 ber included in the at least one user-programmed
 call-back number, the corresponding user-pro-
 grammed special audible alert in accordance with
 the data defining said alert,
 wherein the processor comprises a first processor
 element for controlling the audible alert generator
 to generate the user-programmed default audible
 alert in response to the received call-back number
 being found not equal to any call-back number
 included in the at least one user-programmed call
 back number.

9. The selective call receiver in accordance with
 claim 8, further comprising user controls coupled to the
 processor and to the memory element for allowing a
 user to add or delete a user-programmed call-back num-
 ber and a corresponding user-programmed special audi-
 ble alert.

10. The selective call receiver in accordance with
 claim 8, wherein the memory element comprises a non-
 volatile memory.

11. The selective call receiver in accordance with
 claim 8, further comprising user controls coupled to the
 processor for allowing a user to modify the user-pro-
 grammed default audible alert.

12. The selective call receiver in accordance with
 claim 11, further comprising a second processor ele-
 ment coupled to the processor and responsive to the
 user controls for controlling the generation of the user-
 programmed default audible alert,
 wherein the second processor element disallows gener-
 ation of the user-programmed default audible
 alert but allows generation of the user-pro-
 grammed special audible alert in response to user
 selection of a first alert mode, and
 wherein the second processor element allows genera-
 tion of both the user-programmed default audible
 alert and the user-programmed special audible alert
 in response to user selection of a second alert mode.

5,394,140

11

13. The selective call receiver in accordance with claim 9, wherein the user controls comprise: first elements that allow a user to select a cadence for a new user-programmed special audible alert; and second elements that allow a user to select a tone frequency for the new user-programmed special audible alert, and wherein the audible alert generator generates the new user-programmed special audible alert in accordance with the selected cadence and tone frequency.
14. The selective call receiver in accordance with claim 11, wherein the user controls comprise: first elements that allow a user to select a cadence for the user-programmed default audible alert; and second elements that allow a user to select a tone frequency for the user-programmed default audible alert, and wherein the audible alert generator generates the user-programmed default audible alert in accordance with the selected cadence and tone frequency.
15. A method in a communication receiver for controlling an audible alert in response to a received call-back number, the method comprising the steps of:
- (a) receiving a message comprising at least the received call-back number;
 - (b) comparing the received call-back number with at least one user-programmed call-back number;
 - (c) selecting a user-programmed special audible alert corresponding to the received call-back number in response to determining in step (b) that the received call-back number is equal to a call-back number included in the at least one user-programmed call-back number;
 - (d) selecting a user-programmed default audible alert in response to determining in step (b) that the re-

12

- ceived call-back number is not equal to any call-back number included in the at least one user-programmed call-back number; and
- (e) generating the user-programmed audible alert selected in accordance with steps (c) and (d).
16. The method in accordance with claim 15, further comprising the step of adding a new user-programmed call-back number and a corresponding new user-programmed special audible alert in response to a user control sequence.
17. The method in accordance with claim 15, further comprising the step of deleting an existing user-programmed call-back number and a corresponding user-programmed special audible alert in response to a user control sequence.
18. The method in accordance with claim 15, further comprising the step of modifying the user-programmed default audible alert in response to a user control sequence.
19. The method in accordance with claim 15, wherein step (d) further comprises the step of de-selecting the user-programmed default audible alert to prevent the generation thereof, a user of the communication receiver having selected a silent alert mode.
20. The method in accordance with claim 16, wherein the step of adding the new user-programmed call-back number and the corresponding new user-programmed special audible alert comprises the steps of:
- selecting a user-programmable cadence for the new user-programmed special audible alert; and
 - selecting a user-programmable tone frequency for the new user-programmed special audible alert, and
- wherein the new user-programmed special audible alert is generated in accordance with the selected cadence and tone frequency.

* * * * *

40

45

50

55

60

65

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 5,394,140
DATED : February 28, 1995
INVENTOR(S) : Wong et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 10, line 9, please delete "(Amended)".

Signed and Sealed this
Twelfth Day of September, 1995

Attest:



BRUCE LEHMAN

Attesting Officer

Commissioner of Patents and Trademarks

3

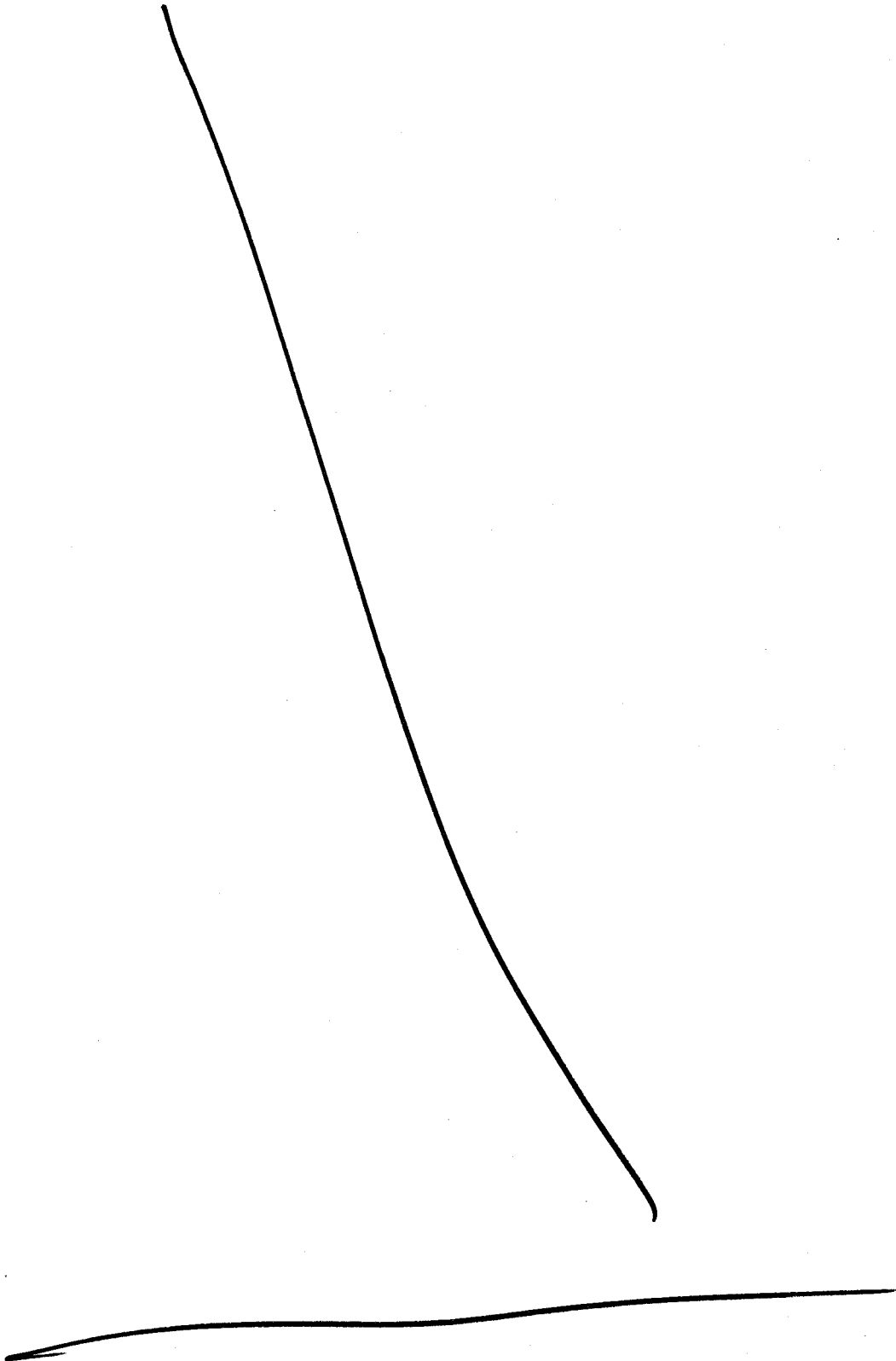


Exhibit 3



US005612682A

United States Patent [19]

DeLuca et al.

[11] Patent Number: 5,612,682

[45] Date of Patent: Mar. 18, 1997

[54] **METHOD AND APPARATUS FOR CONTROLLING UTILIZATION OF A PROCESS ADDED TO A PORTABLE COMMUNICATION DEVICE**

5,335,278 8/1994 Matchett et al. 340/825.34
5,371,493 12/1994 Sharpe et al. 340/825.33

[75] Inventors: Michael J. DeLuca, Boca Raton;
George W. Smoot, Lake Worth;
Douglas R. Kraul, Parkland, all of Fla.

Primary Examiner—Michael Horabik
Assistant Examiner—Edward Merz
Attorney, Agent, or Firm—John H. Moore

[73] Assignee: Motorola, Inc., Schaumburg, Ill.

[21] Appl. No.: 452,785

[22] Filed: May 30, 1995

[51] Int. Cl.⁶ G07D 7/00; G08B 5/22

[52] U.S. Cl. 340/825.34; 340/825.44;
340/825.33; 379/57

[58] Field of Search 340/825.34, 825.44,
340/825.33, 825.35, 825.22; 379/57; 395/200.01,
200.05

[56] References Cited

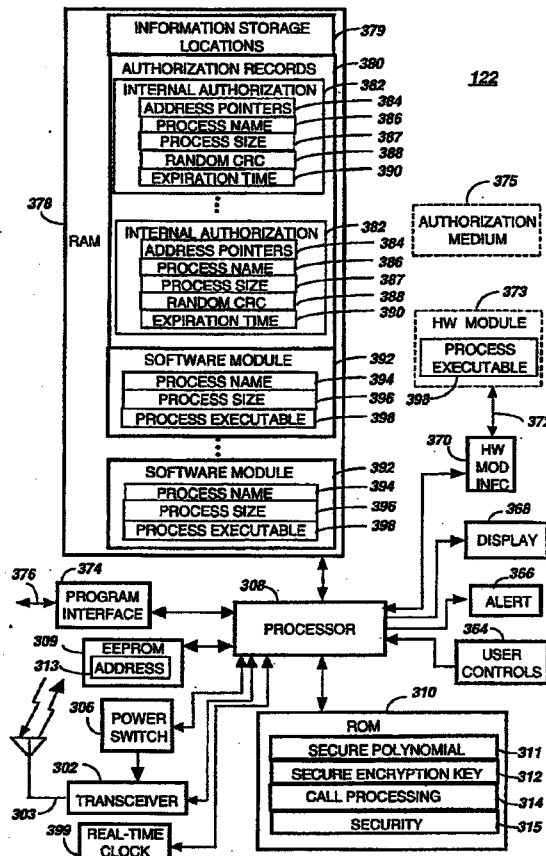
U.S. PATENT DOCUMENTS

4,875,038 10/1989 Siwiak et al. 340/825.44

24 Claims, 7 Drawing Sheets

[57] ABSTRACT

A method and apparatus in a communication system operated by a service provider controls utilization of a module (602, 606) added to a portable communication device (122) including a transceiver (302) which communicates with a fixed portion (102) of the communication system. The portable communication device (122) receives (604) a request for utilization of the module. In response, the portable communication device (122) acts (612) to obtain a usage authorization for utilizing the module. The portable communication device (122) disallows (640) the utilization of the module, in response to the usage authorization being unobtainable.



U.S. Patent

Mar. 18, 1997

Sheet 1 of 7

5,612,682

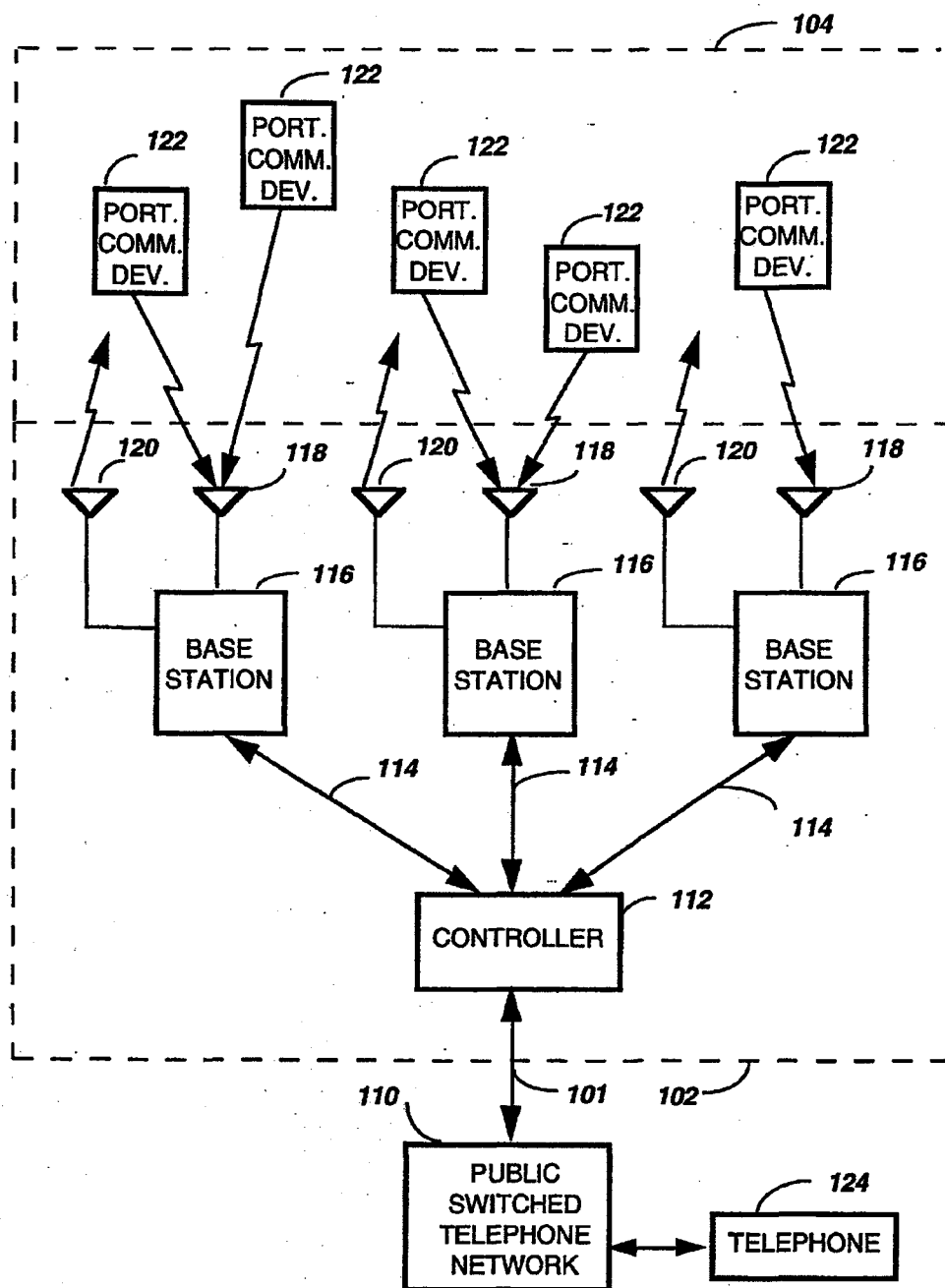


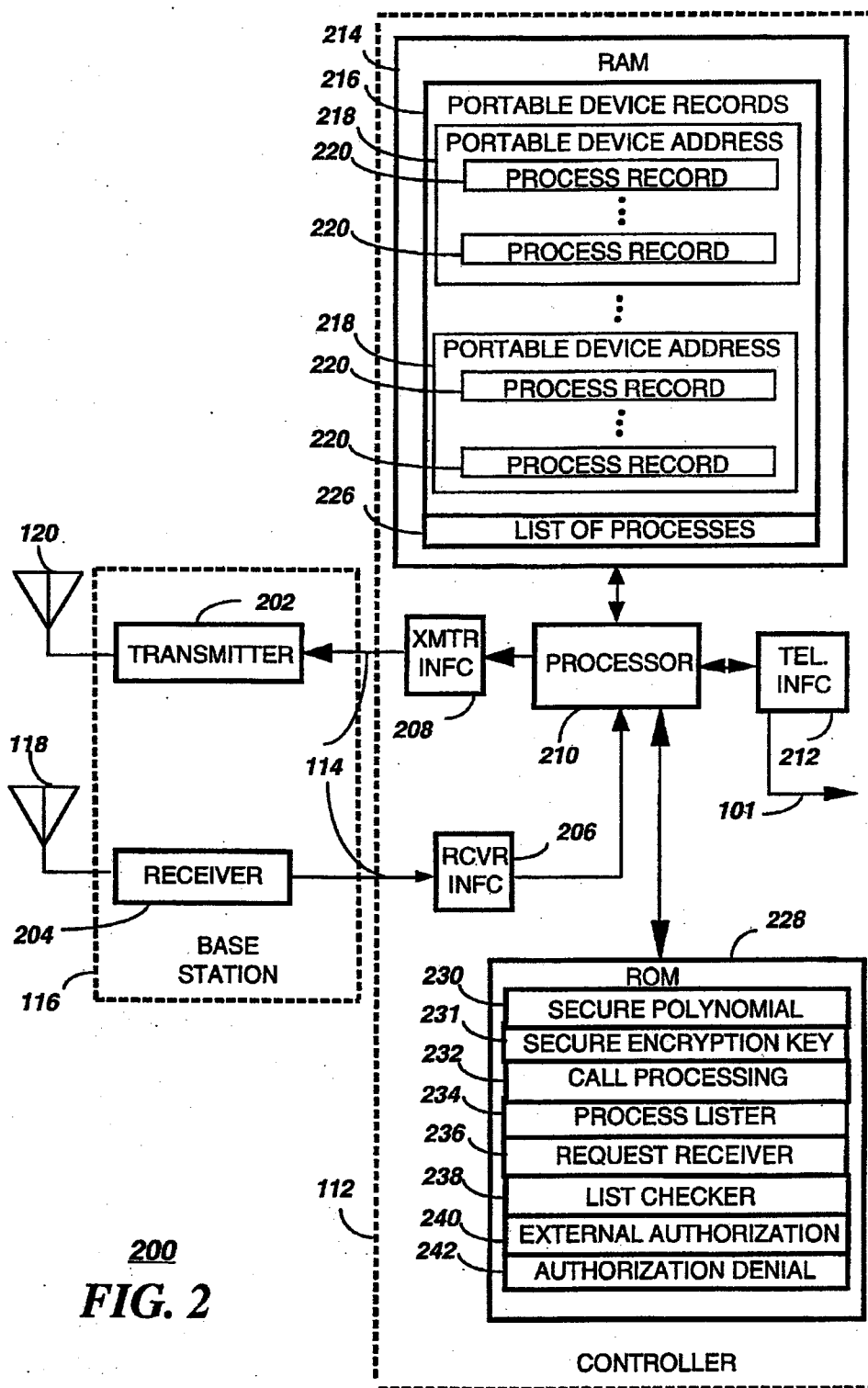
FIG. 1

U.S. Patent

Mar. 18, 1997

Sheet 2 of 7

5,612,682



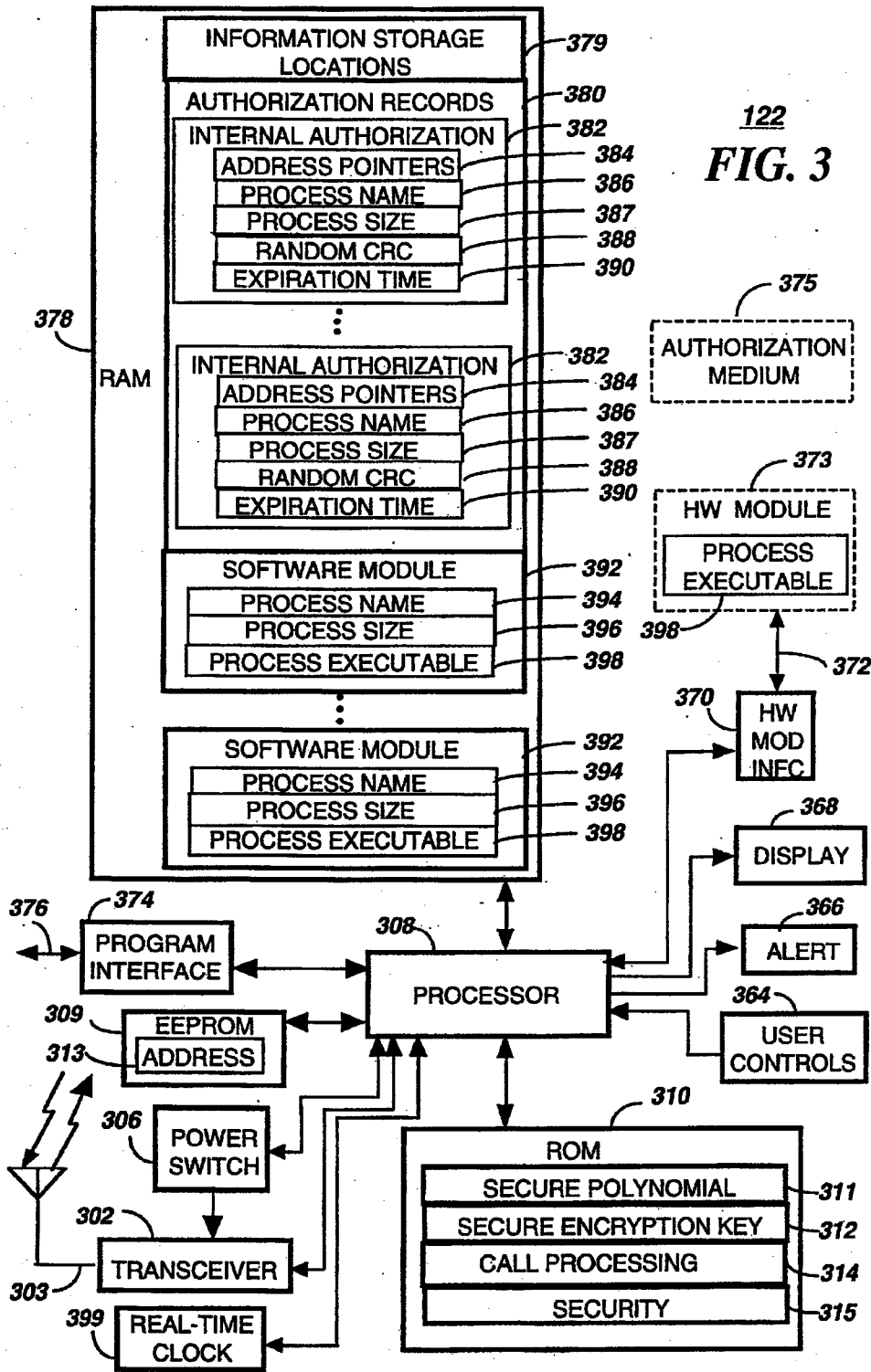
200
FIG. 2

U.S. Patent

Mar. 18, 1997

Sheet 3 of 7

5,612,682



U.S. Patent

Mar. 18, 1997

Sheet 4 of 7

5,612,682

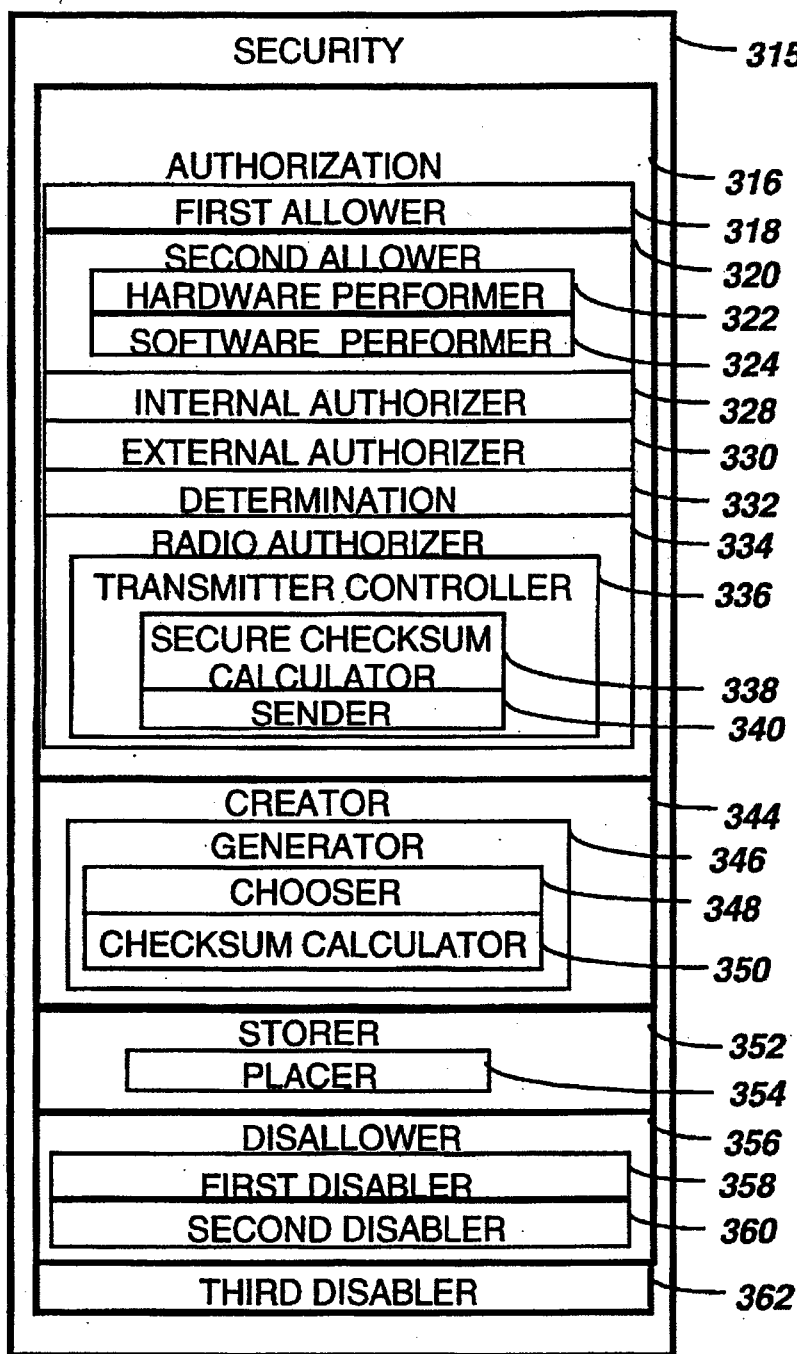


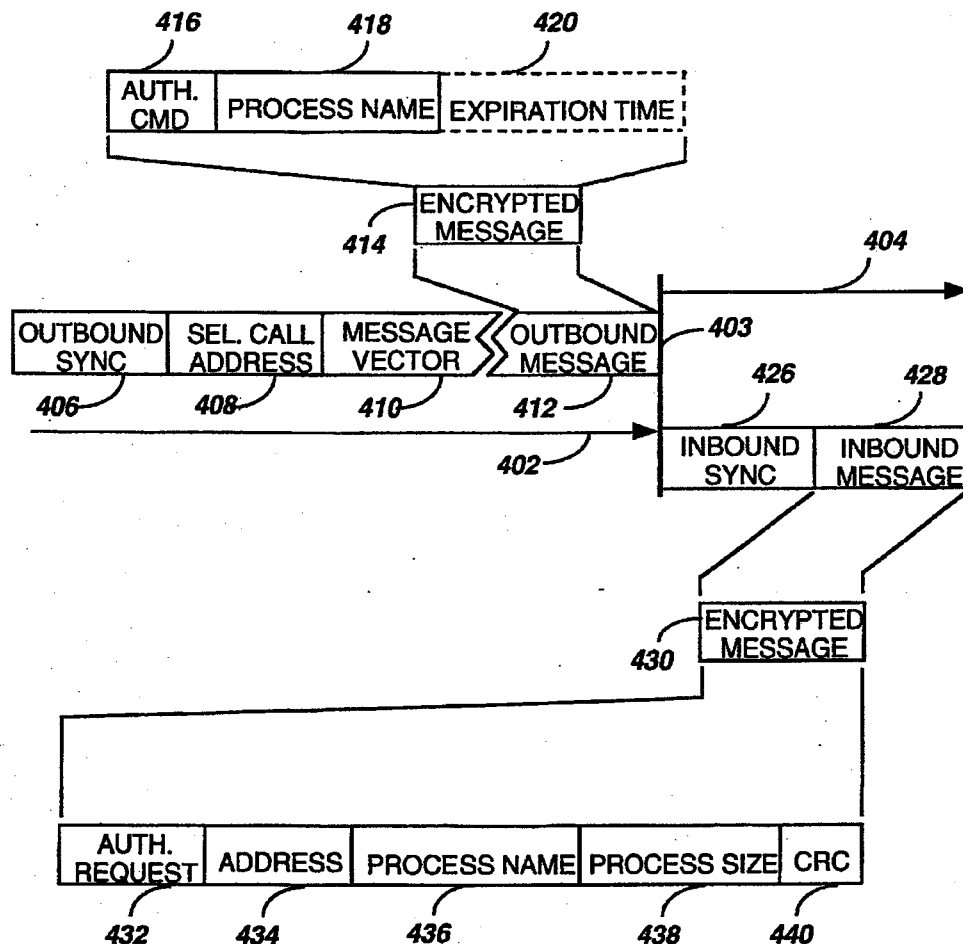
FIG. 4

U.S. Patent

Mar. 18, 1997

Sheet 5 of 7

5,612,682



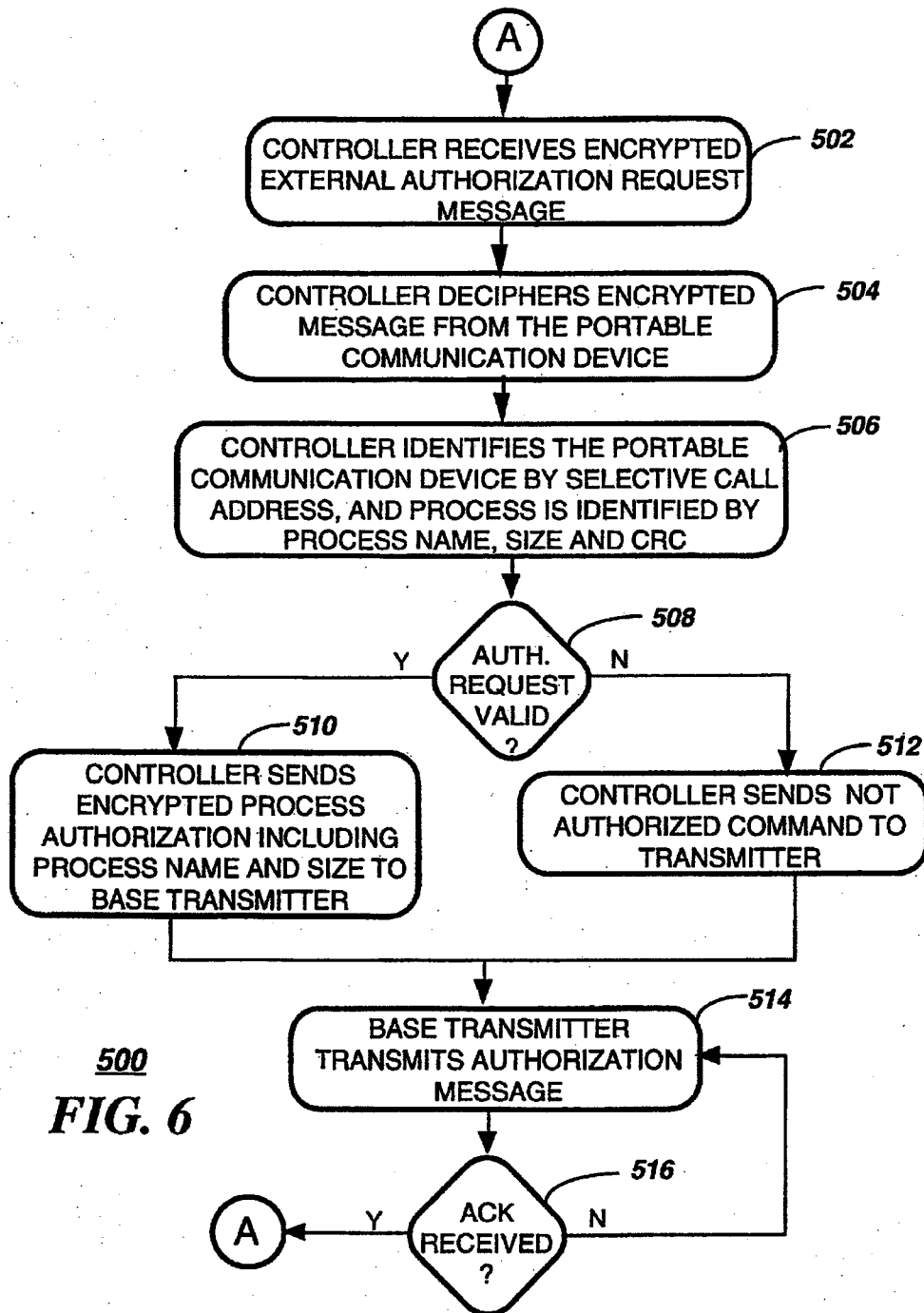
400
FIG. 5

U.S. Patent

Mar. 18, 1997

Sheet 6 of 7

5,612,682



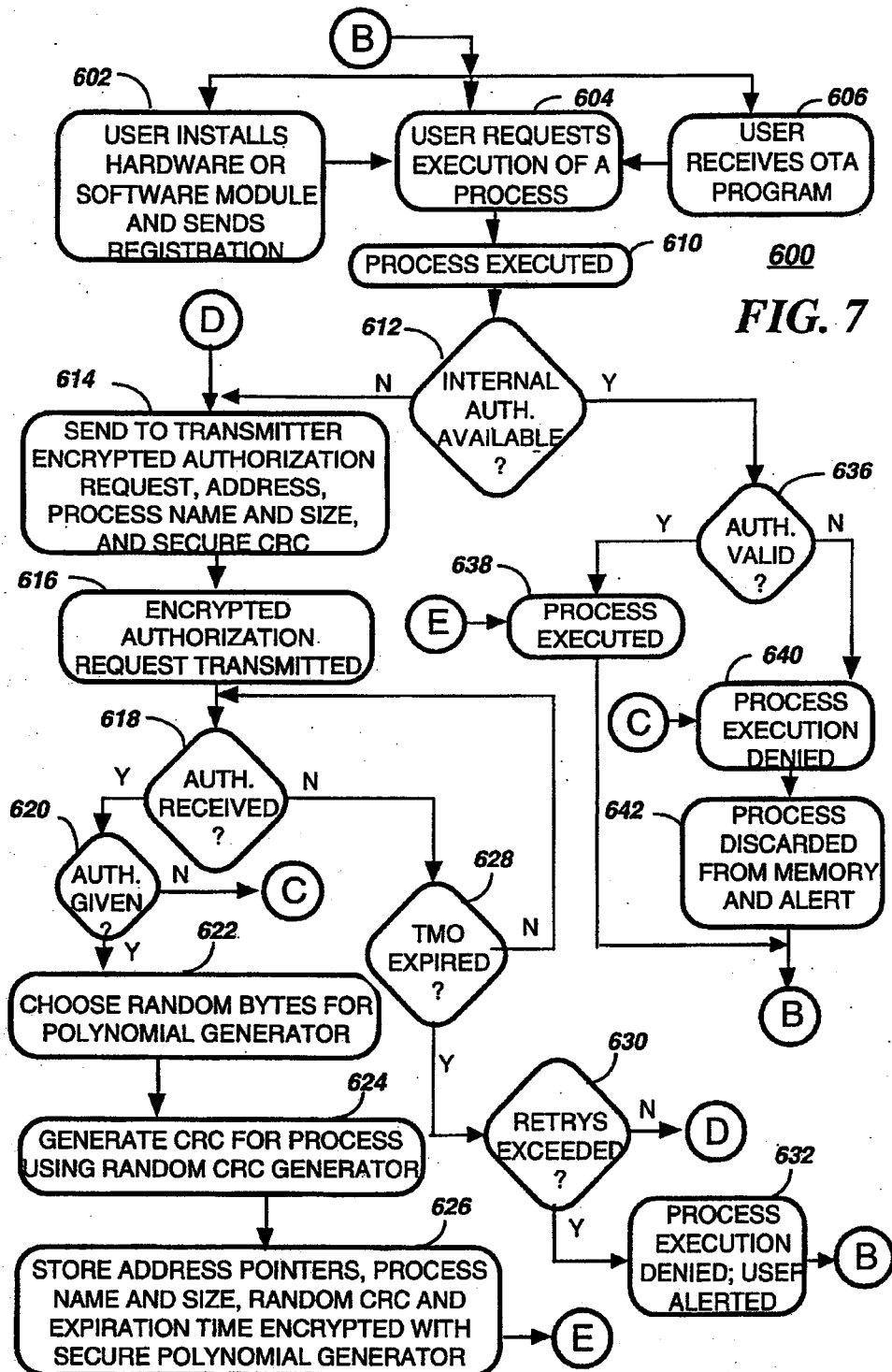
500
FIG. 6

U.S. Patent

Mar. 18, 1997

Sheet 7 of 7

5,612,682



5,612,682

1

METHOD AND APPARATUS FOR CONTROLLING UTILIZATION OF A PROCESS ADDED TO A PORTABLE COMMUNICATION DEVICE

FIELD OF THE INVENTION

This invention relates in general to communication systems, and more specifically to a method and apparatus for controlling utilization of a process added to a portable communication device.

BACKGROUND OF THE INVENTION

In the past, paging devices were limited to alpha-numeric and voice paging. With technology improvements in circuit integration and more efficient communication protocols which provide two-way communication, paging devices have grown in sophistication and services provided. With today's technology improvements paging devices are expected to acquire more sophisticated functions such as electronic mailing services, spread sheet applications, investment finance services such as stock market charts, quotation requests, purchase and sale transactions, etc. These services require sophisticated software applications and/or hardware modules to be operated in the paging device. Paging devices using sophisticated services such as these will require a means for registration and licensing to prevent unauthorized use of processes, including software applications and hardware modules. In prior art devices registration has been accomplished by mailing a signed certificate with a purchase receipt of a software application or hardware module. This form of registration, however, does not prevent an unscrupulous user from using pirated software applications and/or unauthorized hardware modules.

Thus, what is needed is a method and apparatus for controlling utilization of a process added to a portable communication device. Preferably, the method and apparatus serves as a mechanism to prevent unauthorized use of software applications and hardware modules.

SUMMARY OF THE INVENTION

One aspect of the present invention is a method in a communication system operated by a service provider, the method for controlling utilization of a module added to a portable communication device comprising a transceiver which communicates with a fixed portion of the communication system. The method comprises in the portable communication device the steps of receiving a request for utilization of the module, and, in response, acting to obtain a usage authorization for utilizing the module. The method further comprises the step of disallowing the utilization of the module, in response to the usage authorization being unobtainable.

Another aspect of the present invention is a portable communication device in a communication system operated by a service provider, the portable communication device for controlling utilization of a module added thereto. The portable communication device comprises a transceiver for communicating with a fixed portion of the communication system, and a processor coupled to the transceiver for controlling the portable communication device. The portable communication device further comprises a memory coupled to the processor for storing information used by the portable communication device, and user controls coupled to the processor for receiving a request for utilization of the

2

module. The portable communication device also includes an authorization element coupled to the processor for acting to obtain a usage authorization for utilizing the module, and a disallower element coupled to the processor for disallowing the utilization of the module, in response to the usage authorization being unobtainable.

Another aspect of the present invention is a controller for use in a fixed portion of a communication system. The controller comprises a processor for controlling operation of the controller, and a memory coupled to the processor for storing information used by the controller. The controller further comprises a transmitter interface coupled to the processor for transmitting a message to a portable communication device, and a receiver interface coupled to the processor for receiving a communication from the portable communication device. The controller also includes apparatus for authorizing utilization of a process added to the portable communication device. The apparatus comprises a process lister element coupled to the processor maintaining in the memory a list of authorized processes corresponding to the portable communication device, and a request receiver element coupled to the processor for receiving a request for an external authorization from the portable communication device. The request comprises at least a process name and a process size corresponding to a process, along with a secure checksum and an address identifying the portable communication device. The apparatus further comprises a list checker element coupled to the processor for checking the list of authorized processes corresponding to the portable communication device identified by the address, to determine whether the process corresponding to the process name is authorized. The apparatus also includes an external authorization element coupled to the processor for transmitting the external authorization to the portable communication device in response to the module being authorized for the portable communication device, and an authorization denial element coupled to the processor for transmitting a "not authorized" signal to the portable communication device in response to the process not being authorized for the portable communication device.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an electrical block diagram of a communication system in accordance with the preferred embodiment of the present invention.

FIG. 2 is an electrical block diagram of elements of a fixed portion of the communication system in accordance with the preferred embodiment of the present invention.

FIGS. 3 and 4 are elements of an electrical block diagram of a portable communication device in accordance with the preferred embodiment of the present invention.

FIG. 5 is a timing diagram of elements of an outbound protocol and an inbound protocol of the fixed and portable portions of the communication system in accordance with the preferred embodiment of the present invention.

FIG. 6 is a flow chart depicting operation of the fixed portion of the communication system in accordance with the preferred embodiment of the present invention.

FIG. 7 is a flow chart depicting operation of the portable communication device in accordance with the preferred embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, an electrical block diagram of a communication system in accordance with the preferred

5,612,682

3

embodiment of the present invention comprises a fixed portion 102 and a portable portion 104. The fixed portion 102 includes a plurality of base stations 116, for communicating with the portable portion 104, utilizing conventional techniques well known in the art, and coupled by communication links 114 to a controller 112 which controls the base stations 116. The hardware of the controller 112 is preferably a combination of the Wireless Messaging Gateway (WMG™) Administrator! paging terminal and the RF-Conductor!™ message distributor manufactured by Motorola, Inc. The hardware of the base stations 116 is preferably a combination of the Nucleus® Orchestra! transmitter and RF-Audience!™ receivers manufactured by Motorola, Inc. It will be appreciated that other similar hardware can be utilized as well for the controller 112 and base stations 116.

Each of the base stations 116 transmits radio signals to the portable portion 104 comprising a plurality of portable communication devices 122 via a transmitting antenna 120. The base stations 116 each receive radio signals from the plurality of portable communication devices 122 via a receiving antenna 118. The radio signals comprise selective call addresses and messages transmitted to the portable communication devices 122 and acknowledgments received from the portable communication devices 122. It will be appreciated that the portable communication devices 122 can also originate messages other than acknowledgments, as will be described below. The controller 112 preferably is coupled by telephone links 101 to a public switched telephone network (PSTN) 110 for receiving selective call originations therefrom. Selective call originations comprising voice and data messages from the PSTN 110 can be generated, for example, from a conventional telephone 124 coupled to the PSTN 110 in a manner that is well known in the art.

Data and control transmissions between the base stations 116 and the portable communication devices 122 preferably utilize a protocol similar to Motorola's well-known FLEX™ digital selective call signaling protocol. This protocol utilizes well-known error detection and error correction techniques and is therefore tolerant to bit errors occurring during transmission, provided that the bit errors are not too numerous in any one code word.

Outbound channel transmissions comprising data and control signals from the base stations 116 preferably utilize two and four-level frequency shift keyed (FSK) modulation, operating at sixteen-hundred or thirty-two-hundred symbols-per-second (sps), depending on traffic requirements and system transmission gain. Inbound channel transmissions from the portable communication devices 122 to the base stations 116 preferably utilize four-level FSK modulation at a rate of ninety-six-hundred bits per second (bps). Inbound channel transmissions preferably occur during predetermined data packet time slots synchronized with the outbound channel transmissions. It will be appreciated that, alternatively, other signaling protocols, modulation schemes, and transmission rates can be utilized as well for either or both transmission directions. The outbound and inbound channels preferably operate on a single carrier frequency utilizing well-known time division duplex (TDD) techniques for sharing the frequency. It will be further appreciated that, alternatively, the outbound and inbound channels can operate on two different carrier frequencies using frequency division multiplexing (FDM) without requiring the use of TDD techniques.

U.S. Pat. No. 4,875,038 to Siwiak et al., which describes a prior art acknowledge-back radio communication system, is hereby incorporated herein by reference. For further

4

information on the operation and structure of an acknowledge-back radio communication system, please refer to the Siwiak et al. patent.

Referring to FIG. 2, an electrical block diagram of elements 200 of the fixed portion 102 in accordance with the preferred embodiment of the present invention comprises portions of the controller 112 and the base stations 116. The controller 112 comprises a processor 210 for directing operation of the controller 112. The processor 210 preferably is coupled through a transmitter interface 208 to a transmitter 202 via the communication links 114. The communication links 114 use conventional means well known in the art, such as a direct wire line (telephone) link, a data communication link, or any number of radio frequency links, such as a radio frequency (RF) transceiver link, a microwave transceiver link, or a satellite link, just to mention a few. The transmitter 202 transmits two and four-level FSK data messages to the portable communication devices 122. The processor 210 is also coupled to at least one receiver 204 through a receiver interface 206 via the communication links 114. The receiver 204 demodulates four level FSK and can be collocated with the base stations 116, as implied in FIG. 2, but preferably is positioned remote from the base stations 116 to avoid interference from the transmitter 202. The receiver 204 is for receiving one or more acknowledgments and/or messages from the portable communication devices 122.

The processor 210 is coupled to a telephone interface 212 for communicating with the PSTN 110 through the telephone links 101 for receiving selective call originations. The processor 210 is also coupled to a random access memory (RAM) 214 comprising a database of portable device records 216 and a database of processes 226. The database of portable device records 216 contains, as a minimum, a list of process records 220 for each portable communication device 122. To access the list of process records 220 of a portable communication device 122, a portable device address 218 corresponding to the address of a portable communication device 122 is used to search the database of portable device records 216. The list of process records 220 specifies the software and hardware processes which are authorized for use by a portable communication device 122 having the portable device address 218. Each process record 220 contains a list of process verification elements used for process authorization of external authorization requests transmitted by the portable communication devices 122, as will be described below. The verification elements contained in the process record 220 for both hardware and software processes include a process name, a process size and a secure cyclic redundancy check (CRC).

The database of processes 226 preferably comprises binary executables (machine code) of many of the authorized software processes available for use by the portable communication devices 122. The software processes stored in the RAM 214 of the controller preferably can be delivered to portable communication devices 122 by way of over-the-air (OTA) programming utilizing techniques well known in the art.

The processor 210 also is coupled to a read-only memory (ROM) 228. It will be appreciated that other types of memory, e.g., electrically erasable programmable ROM (EEPROM) or magnetic disk memory, can be utilized for the ROM 228, as well as the RAM 214. It will be further appreciated that the RAM 214 and the ROM 228, singly or in combination, can be integrated as a contiguous portion of the processor 210. Preferably, the processor 210 is similar to the DSP56100 digital signal processor (DSP) manufactured

5,612,682

5

by Motorola, Inc. It will be appreciated that other similar processors can be utilized for the processor 210, and that additional processors of the same or alternate type can be added as required to handle the processing requirements of the controller 112.

The first two elements in the ROM 228 include a secure polynomial 230 and a secure encryption key 231. The secure polynomial 230 is used as a secure polynomial generator for CRC verification of process executables requested by external authorization request messages transmitted by portable communication devices 122. The portable communication devices 122 use the same secure polynomial generator for CRC generation. Using the same secure polynomial generator for both the fixed portion 102 and portable portion 104 of the communication system provides a means for verifying authenticity of software and hardware processes requested by the portable communication devices 122. The secure encryption key 231 is used for encryption and decryption of authorization messages transmitted between the portable communication devices 122 and the base stations 116. Similarly, the portable communication devices 122 use the same secure encryption key for external authorization message transactions. Using secure encryption between the fixed portion 102 and the portable portion 104 of the communication system provides a method for transmitting secure two-way messages which are unlikely to be breached. The encryption process converts an unscrambled sequence to a pseudo-random sequence coded by a scrambler and decoded by a descrambler. The scrambler and descrambler use preferably polynomial generators with feedback paths which use modulo 2 (Exclusive Or) addition on the feedback taps. The descrambler uses the same architecture as the scrambler for descrambling the message. Using a nonlinear feedback shift register (NFSR) architecture provides a secure approach for message encryption which makes it difficult, if not computationally intractable for a person to decipher the encryption key. The present invention preferably uses a conventional self-synchronizing stream encryption system which utilizes a NFSR architecture, as is well known by one of ordinary skill in the art. It will be appreciated that, alternatively, other methods which provide suitably secure encryption may be used. It will be further appreciated that, alternatively, message transactions between the base stations 116 and the portable communication devices 122 can be non-encrypted.

To protect against unauthorized access, the secure polynomial 230 and the secure encryption key 231 preferably are stored in a secure portion of the ROM 228 which can only be accessed by the processor 210. Preferably, this portion of the ROM 228 is integrated with the processor 210 as a protected mask read only memory (MROM), and is programmed during the manufacturing process of the processor 210. As is well known by one of ordinary skill in the art, once a protected MROM has been programmed the protected portion of the MROM is only accessible by the processor 210 and cannot be accessed by external hardware coupled to the processor 210. Alternatively, the secure polynomial 230 and the secure encryption key 231 may be included in a re-programmable non-volatile memory such as a FLASH memory, an EEPROM memory or magnetic disk memory, but accessibility of the secure polynomial 230 and secure encryption key 231 are preferably restricted by the service provider to authorized personnel only. Using re-programmable non-volatile memories provides flexibility of adding more polynomial elements and encryption keys for system and subscriber unit expansion.

The ROM 228 of the processor 210 also includes firmware elements for use by the processor 210. The firmware

6

elements include a call processing element 232, a process lister element 234, a request receiver element 236, a list checker element 238, an external authorization element 240 and an authorization denial element 242. The call processing element 232 handles the processing of an incoming call for a called party and for controlling the transmitter 202 to send a selective call message to the portable communication device 122 corresponding to the called party, utilizing techniques well known in the art. The process lister element 234 manages the database of portable device records 216 stored in the RAM 214 for each portable communication device 122 utilizing database management techniques well known in the art. The request receiver element 236 processes encrypted external authorization request messages received by the receiver 204 of the base station 116 and originating from the portable communication devices 122. The encrypted external authorization request message is decrypted with the secure encryption key 231 described above. The external authorization request for hardware and software processes comprises at least a process name and a process size corresponding to the process, along with a secure checksum and an address identifying the portable communication device 122. Optionally, an authorization request command can accompany the external authorization request message. Preferably, the authorization request command is included in the address portion of the portable communication device 122 address. Alternatively, the authorization request command can be in a separate element in the external authorization request message. The secure checksum is preferably a secure CRC of the software process for which the portable communication device 122 is requesting authorization. The CRC is generated by the portable communication device 122 by using a polynomial generator stored in its memory, which is the same as the secure polynomial 230 used by the controller 112, as described above. The secure checksum provides a means for verifying that the process being used by the portable communication device 122 is an authorized version. The list checker element 238 uses the address, corresponding to the portable communication device 122, received in the external authorization request message as a portable device address 218. The processor 210, as described above, searches through the database of portable device records 216 to find the list of process records 220 corresponding to the portable device address 218 matching the address of the portable communication device 122. The list checker element 238 then checks each process record 220 for a match to the process name, process size and secure CRC received in the external authorization request message. If a match is found, then authorization is given to the portable communication device 122 for using the requested software or hardware process. If a match is not found, then authorization is denied. When the list checker element 238 authorizes a process requested by the portable communication device 122, the processor 210 calls on the external authorization element 240 to process the external authorization response message to be transmitted to the portable communication device 122. The external authorization response message preferably comprises an authorization command, the process name of the authorized process and an expiration time for the process. It will be appreciated that, alternatively, the external authorization response message can include a plurality of process names and expiration times authorizing a plurality of processes requested by the portable communication device 122. Before the external authorization element 240 sends the external authorization response message to the transmitter 202 of the base station 116, the external authorization

5,612,682

7

response message is encrypted, using the method described above, to secure the RF transmission of the message. When the list checker element 238 denies authorization of a process to a portable communication device 122, the processor 210 calls on the authorization denial element 242 to process the external authorization denial response message to be transmitted to the portable communication device 122. The external authorization denial response message comprises an authorization command which includes a "not authorized" signal denying authorization, and a process name of the process being denied. It will be appreciated that the external authorization denial response message may include a plurality of process names denying authorization to a plurality of processes requested by the portable communication device 122. As is done with the external authorization response message, the external authorization denial response message is encrypted before it is transmitted to the portable communication device 122 by the base stations 116.

Referring to FIG. 3, an electrical block diagram of the portable communication device 122 in accordance with the preferred embodiment of the present invention comprises a transceiver antenna 303 for transmitting radio signals to the base stations 116 and for intercepting radio signals from the base stations 116. The transceiver antenna 303 is coupled to a transceiver 302 utilizing conventional techniques well known in the art. The radio signals received from the base stations 116 use conventional two and four-level FSK. The radio signals transmitted by the portable communication device 122 to the base stations 116 use four-level FSK.

Radio signals received by the transceiver 302 produce demodulated information at the output. The demodulated information is coupled to the input of a processor 308, which processes the information in a manner well known in the art. Similarly, inbound response messages are processed by the processor 308 and delivered to the transceiver 302 which is coupled to the processor 308. The response messages transmitted by the transceiver 302 are preferably modulated using four-level FSK.

A conventional power switch 306, coupled to the processor 308, is used to control the supply of power to the transceiver 302, thereby providing a battery saving function. The processor 308 is coupled to a random access memory (RAM) 378 for storing messages in information storage locations 379. The RAM 378 further comprises authorization records 380 and software modules 392. The authorization records 380 include internal authorization records 382 of processes, either software or hardware, which have been authorized for use by the portable communication device 122. The software modules 392 include a process name 394, a process size 396 and a process executable 398. The internal authorization record 382 is encrypted using a secure encryption key 312 stored in a read only memory (ROM) 310 of the portable communication device 122. The encryption key used is the same as that used by the controller 112 described above. The internal authorization record 382 for hardware and software processes comprises address pointers 384, a process name 386, a process size 387, a random CRC 388 of the authorized hardware or software process executable 398 and an expiration time 390. The address pointers 384 preferably include two address pointers which point to two byte locations within the process executable 398 of the authorized hardware or software process. The two bytes are chosen by a random process which preferably uses a real-time clock 399 for generating random address pointers. The real-time clock 399 determines time (in hours, minutes and seconds) and calendar date, which is also used for determining the expiration time of a process, as will be described

8

below. To determine the two random address pointers the real-time clock 399 is used in conjunction with the random event of the user requesting use of a process through the user controls 364. When the user depresses a button on the user controls 364 requesting execution of a process, the processor 308 reads the time specified by the real-time clock 399. The real-time clock 399 reading is in binary format and is sufficiently long to cover a wide address spectrum. Depending on the number of bytes contained in the process executable 398 the user is requesting, a limited number of bits are chosen in the real-time clock reading to cover the size of the process executable 398. The limited real-time clock reading is then used as an address pointer to a first random byte in the requested process executable 398. The second random address pointer points to a second random byte location. The two bytes together represent a 16 bit polynomial generator seed for generating the random CRC 388 of the hardware or software process executable 398. As is well known by one of ordinary skill in the art, a polynomial generator must follow certain guidelines such as, for example, the polynomial generator must not contain all zeros or all ones. When the two bytes chosen violate any polynomial generator rules, the address pointers are moved to a next higher location in the process executable 398. If the end of the process executable 398 is reached then the random address pointers wrap around to the beginning of the process executable 398. This process continues until a valid set of bytes are chosen which meet the polynomial generator rules. It will be appreciated that, alternatively, more than two bytes may be used for the random polynomial generator. The expiration time 390 includes a date, and optionally a time when the authorization of the hardware or software process expires. Whenever a process execution is requested by the user, the expiration time 390 is compared to the real-time clock 399 to determine if authorization of the hardware or software process has expired. It will be appreciated that reprogrammable non-volatile memory devices, such as, for example, EEPROM or FLASH memories, may be used to prevent loss of the authorization records 380 stored in the RAM 378 during a power outage.

The processor 308 is also coupled to a programming interface 374 and a hardware module interface 370. The programming interface 374 allows for external software module download into the RAM 378. The programming interface 374 preferably uses a serial communication interface 376 for communication with the processor 308. The serial interface preferably uses a conventional universal asynchronous receiver transmitter (UART) well known in the art. The physical means for the interface preferably uses metal contacts. It will be appreciated that, alternatively, other physical means may be used, such as infrared, inductive coupling, etc. The hardware module interface 370 allows for attachments of hardware modules to the portable communication device 122. The hardware module interface 370 preferably uses a hardware interface 372, well known in the art, such as the Personal Computer Memory Card International Association (PCMCIA) interface. With this interface any type of hardware module 373 conforming to the PCMCIA standard may be attached to the portable communication device 122. The function of the hardware module 373 can include any number of functions such as a software module hardware accelerator, video graphics card, expanded memory card, etc. It will be appreciated that the programming interface 374 and the hardware module interface 370 may use any other interfaces for software download and hardware attachments, well known in the art.

The ROM 310 coupled to the processor 308 comprises a secure polynomial 311, a secure encryption key 312 and

5,612,682

9

firmware elements for use by the processor 308. It will be appreciated that other types of memory, e.g., EEPROM, can be utilized as well for the ROM 310. The secure polynomial 311 includes a secure polynomial generator for CRC generation of hardware and software process executables 398. The secure polynomial 311 used by the portable communication device 122 matches the secure polynomial 230 used by the controller 112 described above. The secure encryption key 312 is used for scrambling and descrambling external authorization messages transmitted between the portable communication device 122 and the base stations 116. The secure encryption key 312 used by the portable communication device 122 matches the secure encryption key 231 used by the controller 112. The secure polynomial 311 and secure encryption key 312 are stored in a protected portion of the ROM 310 utilizing the techniques described for the controller 112.

The firmware elements comprise a call processing element 314 which handles incoming messages on the outbound channel using techniques well known in the art. When an address is received by the processor 308, the call processing element 314 compares one or more addresses 313 stored in an EEPROM 309, and when a match is detected, a call alerting signal is generated to alert a user that a message has been received. The call alerting signal is directed to a conventional audible or tactile alerting device 366 for generating an audible or tactile call alerting signal. In addition, the call processing element 314 processes the message which is received in a digitized conventional manner and then stores the message in one of the information storage locations 379 in the RAM 378. The message can be accessed by the user through user controls 364, which provide functions such as lock, unlock, delete, read, etc. More specifically, by the use of appropriate functions provided by the user controls 364, the message is recovered from the RAM 378, and then displayed on a display 368, e.g., a conventional liquid crystal display (LCD).

The firmware elements further comprise a security element 315 for processing authorization of software modules 392 and hardware modules 373. The elements contained in the security element 315 are shown in FIG. 4. The security element 315 includes an authorization element 316, a second allow element 320, a creator element 344, a storer element 352, a disallowed element 356 and a third disabler element 362. When a user requests utilization of a hardware or software process by the use of appropriate functions provided by the user controls 364, the processor 308 calls on the authorization element 316 to process the request. The processor 308 begins the authorization process by invoking a first allow element 318 which, optionally, allows immediate utilization of the process requested. Whether or not the first allow element 318 allows immediate utilization of a process is determined by programming of the portable communication device 122 performed by the system provider. The processor 308 follows by invoking a determination element 332 which is used for making a determination of whether an internal authorization record 382 exists for utilizing the hardware or software process. The determination of a valid internal authorization record 382 is made by searching through the authorization records 380 for a process name 386 which matches the module name of the hardware or software process requested by the user. If a match is determined, then an internal authorizer element 328 is called on by the processor 308 to read the address pointers 384 to determine the random polynomial generator to be used for random CRC generation over the process executable 398 of the hardware or software module. The internal

10

authorizer element 328 uses the process size 387 corresponding to the module size of the hardware or software process executable 398 to calculate a random CRC over the process executable 398 of the hardware or software process. If the CRC generated matches the random CRC 388 stored in the internal authorization record 382, then the processor 308 invokes the second allow element 320 to check the expiration time 390 against the real-time clock 399. If the expiration time has not expired, then the processor 308 allows the utilization of the process, in response to the usage authorization being obtained. However, if the expiration time has expired then the processor 308 calls on the third disabler element 362 for disabling further utilization of the process in response to an expiration of the usage authorization.

If the determination element 332 does not find an internal authorization record 382 for the hardware or software process requested by the user, then a radio authorizer element 334 is called on for communicating with the fixed portion 102 by sending a signal indicative of the hardware or software module to obtain the usage authorization as an external authorization, in response to the internal authorization being absent from the authorization records 380. The radio authorizer element 334 acts to obtain the usage authorization through a first radio channel (the inbound channel) of the communication system. If the external authorization request is denied, then the processor 308 calls on a first disabler element 358 to disable further utilization of the process, in response to receiving a "not authorized" signal through a second radio channel (the outbound channel) of the communication system. If the external authorization request is not received within a predetermined time interval, then the processor 308 invokes a second disabler element 360 to disable utilization of the process requested by the user. To create the external authorization request message, the radio authorizer element 334 invokes a transmitter controller element 336. The transmitter controller element 336 calls on a secure checksum calculator element 338 which uses the secure polynomial 311 stored in the ROM 310 to calculate a secure CRC over the process executable 398 of the hardware or software process requested by the user. Once the secure CRC is determined, the processor 308 prepares an external authorization request message comprising an authorization request command, the address of the portable communication device 122, the process name, the size of the hardware or software process executable 398, and the secure CRC calculated by the secure checksum calculator element 338. Once the external authorization request message has been determined the transmitter controller element 336 encrypts the message with the secure encryption key 312. The processor 308 then invokes a sender element 340 and sends the message to the transceiver 302, which thereafter transmits the encrypted external authorization request message to the base stations 116. If an encrypted external authorization response message is received from the base stations 116 indicating the hardware or software process is authorized, then the processor 308 accesses a second allow element 320 to process the message. If the external authorization response message was for a hardware module 373 authorizing utilization of the process, then the second allow element 320 invokes a hardware performer element 322 for performing the process in accordance with circuits of the hardware module 373. If the external authorization response message was for a software module 392 authorizing utilization of the process, then the second allow element 320 invokes a software performer element 324 for performing the process in accordance with instructions of the software module 392.

5,612,682

11

For software modules 392 or hardware modules 373 which are user-installed, an authorization medium 375 (preferably a registration form with proof of purchase) is physically sent to the service provider to obtain authorization. When the user requests execution of the installed process, the process is optionally executed and the processor 308 invokes the external authorizer element 330 to request an external authorization from the controller 112. The external authorizer element 330 obtains usage authorization by receiving an external authorization from the service provider through a radio channel (the outbound channel) of the communication system. The external authorization request message sent to the base stations 116, as described above, comprises an authorization request command, the portable communication device 122 address, the process name and size, and a secure CRC of the hardware or software process executable 398. When the controller 112 sends an authorization message granting authorization of the hardware or software process, the second allow element 320 allows the utilization of the process, in response to the usage authorization being obtained. In response to obtaining an external authorization allowing utilization of a process, the processor 308 accesses the creator element 344 to create an internal authorization record 382. To create the internal authorization record the processor 308 invokes a generator element 346 which first calls on a chooser element 348 to select preferably two random bytes of the hardware or software process executable 398. The random bytes are preferably chosen using the real-time clock 399 and user invocation of the user controls 364 as described above. Once the random bytes have been determined, and satisfy the polynomial generator rules, a checksum calculator element 350 is invoked to perform a CRC generation on the process executable 398 of the hardware or software module. Once the random CRC 388 has been calculated, the storer element 352 collects the verification elements used for the internal authorization record 382. The verification elements comprise the address pointers 384 for the random polynomial generator, the process name 386, the random CRC 388 calculated by the checksum calculator element 350 and the expiration time 390 received in the external authorization message from the controller 112. The processor 308 then calls on a placer element 354 which uses the secure encryption key 312 to encrypt the verification elements and then stores the result in the authorization records 380 in the RAM 378.

Referring to FIG. 5, a timing diagram 400 depicts elements of an outbound protocol and an inbound protocol of the fixed portion 102 and portable portion 104 of the communication system in accordance with the preferred embodiment of the present invention. The signaling format on the outbound and inbound channels preferably operates on a single carrier frequency utilizing well-known time division duplex (TDD) techniques for sharing the frequency. It will be appreciated that the outbound and inbound channels may use separate frequency channels utilizing frequency division multiplexing (FDM) techniques well known in the art. Using TDD transmission the outbound RF channel transmission is depicted during an outbound transmission time interval 402, while the inbound RF channel transmission is depicted during an inbound transmission time interval 404. The outbound transmission time interval 402 and the inbound transmission time interval 404 are subdivided by a time boundary 403. The time boundary 403 depicts a point in time when the outbound transmissions cease and the inbound transmissions commence.

The elements of the outbound protocol comprise an outbound sync 406, a selective call address 408, a message

12

vector 410 and an outbound message 412, while the inbound protocol comprises an inbound sync 426 and an inbound message 428. The outbound sync 406 provides the portable communication device 122 a means for synchronization utilizing techniques well known in the art. The selective call address 408 identifies the portable communication device 122 for which the outbound message 412 is intended. The message vector 410 points in time within the TDD signal format to the position of the outbound message 412 to be received by the portable communication device 122. The outbound message 412 can be either a well known selective call message, or an external authorization response message in accordance with the present invention. When the outbound message 412 is an external authorization response message, the message received by the portable communication device 122 is an encrypted message 414. The encrypted message 414 comprises an authorization command 416, a process name 418 and, optionally, an expiration time 420. When the authorization command 416 is an authorization command denying authorization for utilization of a requested process, then the expiration time 420 is not included in the encrypted external authorization response message. It will be appreciated that the outbound external authorization response message may be extended to include multiple authorizations and/or denials by sending a plurality of authorization commands 416, associated process names 418 and, optionally, expiration times 420.

Similarly, the inbound sync 426 provides the base stations 116 a means for synchronization utilizing techniques well known in the art. The inbound message 428 can be either a well known acknowledge-back response message, or an external authorization request message in accordance with the present invention. When the inbound message 428 is an external authorization request message, the message transmitted by the portable communication device 122 is an encrypted message 430. The encrypted message 430 comprises an authorization request command 432, an address 434 corresponding to the portable communication device 122, a process name 436, a process size 438 and a secure CRC 440. The secure CRC is determined, as described above, using the secure polynomial 311 over the hardware or software module's process executable 398. It will be appreciated that the authorization request command 432 may be included as part of the field of the address 434. It will also be appreciated that multiple authorization requests may be included within the same inbound message by sending a plurality of process names 436 and process sizes 438 with their associated secure CRCs 440.

During selective call messaging between the base stations 116 and the portable communication devices 122, the communication system protocol described above begins with an outbound message which delivers a message to a portable communication device 122. The portable communication device 122 can, optionally, acknowledge reception of the message on the inbound channel. Acknowledgment messages from the portable communication device 122 are transmitted on the inbound channel during a scheduled period which is referenced to the time boundary 403 described above. Scheduled inbound messages are preferably reserved for acknowledgment messaging from the portable communication devices 122. However, when a user invokes a process which requires transmitting an external authorization request message to the base stations 116, the portable communication device 122 uses an unscheduled time period (slot) referenced to the time boundary 403 for unscheduled messaging to the base stations 116. Note during inbound messaging a time period referenced to the time

5,612,682

13

boundary 403 is reserved for both scheduled and unscheduled inbound messages. Therefore, there is no contention between scheduled and unscheduled inbound messages. Since the number of unscheduled time slots is limited, it is possible for contention to exist among a plurality of portable communication devices 122 transmitting unscheduled inbound messages. To resolve contention with unscheduled inbound messages, the present invention preferably utilizes ALOHA protocol as is well known by one of ordinary skill in the art. Since the present invention concentrates primarily on acquiring authorization of hardware and software modules remotely using the communication system just described, it will be appreciated that message transactions originate first from the portable communication device 122 as unscheduled inbound messages. Subsequent responses from the fixed portion 102 of the communication system are received on the outbound channel. It will be further appreciated that, alternatively, other communication protocols which support two-way communication may be used.

Referring to FIG. 6, a flow chart 500 summarizing the operation of the fixed portion 102 of the communication system in accordance with the preferred embodiment of the present invention begins with step 502 where the controller 112 receives an encrypted external authorization request message. In step 504 the controller 112 decipheres the encrypted message using the secure encryption key 231 stored in the ROM 228. In step 506 the controller 112 identifies the portable communication device 122 requesting the authorization by the address 434 received. Additionally, the controller 112 reads the process verification elements included in the external authorization request message. In step 508 the controller 112 checks for a match between the process verification elements received and the list of process records 220 corresponding to the portable communication device 122. If a match is found, then in step 510 an external authorization response message is constructed authorizing utilization of the process. The external authorization response message comprising the authorization command 416 allowing utilization of the process, the process name 418 of the process authorized and an expiration time 420 for the process. Before sending the message to the base stations 116 for transmission, the external authorization response message is encrypted using the secure encryption key 231 as described above. When a match is not found, then in step 512 an external authorization response message with an "authorization denied" command is constructed. The external authorization response message then comprises the authorization command 416 for denying authorization to the requested process, and the associated process name 418. The denial message, as described above, is encrypted by the controller 112 using the secure encryption key 231. Once either type of the external authorization response message is constructed, then in step 514 the message is sent to the transmitter 202 of the base station 116 where it is transmitted to the portable communication device 122. In step 516 the controller 112 checks for a message acknowledgment response from the portable communication device 122 acknowledging reception of the external authorization response message. If no acknowledgment is received, then the controller 112 resends the message in step 514. The controller 112, preferably, has an option to limit the number of re-transmissions by using, for example, a maximum resend count programmed by the system provider. Once an acknowledgment is received, the controller 112 returns to step 502 where it processes subsequent external authorization request messages from the portable communication devices 122.

14

Referring to FIG. 7, a flow chart 600 summarizing the operation of the portable communication device 122 in accordance with the preferred embodiment of the present invention begins with any one of steps 602, 604 and 606. In step 602 the user installs a hardware or software module and registers the hardware or software module by sending preferably an authorization medium 375 comprising a registration form and proof of purchase receipt. In step 606 the user may receive over-the-air (OTA) programming of a software process. The request for an OTA software download may be performed by the user by way of a conventional telephone 124 call to the system provider. It will be appreciated that other ways may be used for requesting OTA programming of a software process, such as by the use of appropriate functions provided by the user controls 364, in the portable communication device 122 for requesting software processes. Once a software or hardware module has been added to the portable communication device 122 by way of OTA programming or user-installation, the user may request execution of the process in step 604. In step 610 the process is immediately executed without initial authorization. It will be appreciated that the portable communication device 122, optionally, may be programmed by the system provider to skip step 610. In step 612 the processor 308 of the portable communication device 122 checks for the presence of an internal authorization record 382 in the authorization records 380 stored in the RAM 378. Each internal authorization record 382 is decrypted using the secure encryption key 312 stored in the ROM 310. A match is checked between the process name 386 of the internal authorization record 382 and the process name of the requested process. If a match is not found, the processor 308 proceeds to step 614 where an encrypted external authorization request message is constructed comprising the authorization request command 432, the address 434 of the portable communication device 122, the process name 436, the process size 438, and the secure CRC 440 of the process executable 398 requested. In step 616 the encrypted external authorization request is transmitted to the base stations 116. In step 618 the processor 308 waits for an external authorization response message from the base stations 116. If no external authorization response message has been received, then in step 628 a time-out (TMO) indicator is checked. If the TMO indicator has expired, then in step 630 a resend counter is checked for re-transmission requests. If re-transmission requests of the encrypted external authorization request message have been exceeded, then in step 632 the process execution is denied and the user is alerted by the alerting device 366 and display 368 of the portable communication device 122. If the resend counter has not been exceeded, then the processor 308 resends the encrypted external authorization message in step 614. If in step 628 the TMO indicator has not expired, then the processor 308 continues to wait for an external authorization response message from the base stations 116. If an external authorization response message is received, then step 620 checks if the requested process has been authorized for execution. If the requested process has been denied authorization, then step 640 is invoked, where the process is denied execution, and subsequently discarded in step 642 alerting the user to authorization denial. If the requested process has been authorized for execution, then in step 622 preferably two bytes are chosen from within the process executable 398 of the hardware or software module to create a 16 bit random polynomial generator. The random bytes are chosen using the real-time clock 399 and user controls 364 as described above. In step 624, the processor 308 generates a random CRC over the process executable 398 of the

5,612,682

15

authorized hardware or software module. In step 626, an internal authorization record 382 is created comprising the random address pointers 384, the process name 386, the process size 387, the random CRC 388, and the expiration time 390 of the authorized process. The internal authorization record 382 is encrypted with the secure encryption key 312 stored in the ROM 310. Once the internal authorization record 382 has been created, the processor 308 continues to step 638 where process execution is invoked if it has not already been invoked by step 610.

In the case where in step 612 an internal authorization record 382 is found, the processor 308 continues to step 636 where the process verification elements are decrypted and then checked against the requested process executable 398. If the process verification elements are determined to be valid, then in step 638 process execution is invoked if it has not already been invoked by step 610. Validation of the process verification elements consists of matching the random CRC generated over the process executable 398 of the requested hardware or software module with the random CRC found in the internal authorization record. If the process verification elements are determined to be invalid, then in step 640 process execution is denied, and in step 642 the process is discarded from memory (for a software module) and an alert signal is created. The alert signal is preferably an audible and visual alert signal using the alerting device 366 and display 368 of the portable communication device 122. Optionally, an alert signal may be sent to the controller 112 alerting the communication system that an attempt to use an invalid hardware or software module has been detected.

Thus, it should be apparent by now that the present invention provides a method and apparatus for controlling utilization of a hardware or software process added to a portable communication device 122. In particular, the present invention provides a novel method and apparatus for remotely authorizing software and hardware modules added to a portable communication device 122. With the present invention, the authenticity of process executables 398 used by software and hardware modules can advantageously be validated by the fixed portion 102 of the communication system. In addition, the fixed portion 102 of the communication system can alternatively keep track of unauthorized installations and can optionally act upon unauthorized additions of software and hardware modules to the portable communication devices 122 by disabling operation of a portable communication device 122 using OTA techniques well known in the art. Another advantage of the present invention is the option for the system provider to program the portable communication device 122 to execute a hardware or software process without receiving immediate authorization. This option provides a user immediate access to a hardware or software process without burdening the user with the delay of receiving authorization for the process. The present invention also provides an authorization method which is secure for both inbound and outbound messaging by using a message encryption technique described above. Additionally, the authorization method used by the communication system, in accordance with the preferred embodiment of the present invention, advantageously requires only a single message transaction between the fixed portion 102 and the portable portion 104 of the communication system, thus providing efficient use of the communication system bandwidth.

What is claimed is:

1. A method in a communication system operated by a service provider, the method for controlling utilization of a

16

module added to a portable communication device comprising a transceiver which communicates with a fixed portion of the communication system, the method comprising in the portable communication device the steps of:

receiving a request for utilization of the module;
in response, acting to obtain a usage authorization for utilizing the module; and
disallowing the utilization of the module, in response to the usage authorization being unobtainable.

2. The method of claim 1,

wherein the step of acting to obtain the usage authorization comprises the steps of:

allowing the utilization of the module; and
thereafter acting to obtain the usage authorization through a first radio channel of the communication system, and

wherein the disallowing step comprises the step of:
disabling further utilization of the module, in response to receiving a "not authorized" signal through a second radio channel of the communication system.

3. The method of claim 1,

wherein the step of acting to obtain the usage authorization comprises the steps of:

making a determination of whether an internal authorization exists for utilizing the module, the determination made from an authorization record stored in the portable communication device; and
obtaining the usage authorization from the internal authorization, in response to the internal authorization being present in the authorization record, and

wherein the method further comprises the step of:

allowing the utilization of the module, in response to the usage authorization being obtained.

4. The method of claim 1,

wherein the module is user-installed, and

wherein the step of acting to obtain the usage authorization comprises the steps of:

physically sending an authorization medium to the service provider, and
in response, obtaining the usage authorization by receiving an external authorization from the service provider through a radio channel of the communication system, and

wherein the method further comprises the step of:

allowing the utilization of the module, in response to the usage authorization being obtained.

5. The method of claim 1,

wherein the usage authorization comprises information indicative of a time at which the usage authorization will expire, and

wherein the method comprises the steps of:

allowing the utilization of the module in response to obtaining the usage authorization, and
disabling further utilization of the module in response to an expiration of the usage authorization.

6. A portable communication device in a communication system operated by a service provider, the portable communication device for controlling utilization of a module added thereto, the portable communication device comprising:

a transceiver for communicating with a fixed portion of the communication system;

a processor coupled to the transceiver for controlling the portable communication device;

a memory coupled to the processor for storing information used by the portable communication device;

5,612,682

17

user controls coupled to the processor for receiving a request for utilization of the module;

an authorization element coupled to the processor for acting to obtain a usage authorization for utilizing the module; and

a disallower element coupled to the processor for disallowing the utilization of the module, in response to the usage authorization being unobtainable.

7. The portable communication device of claim 6, wherein the authorization element comprises:

- a first allower element for allowing the utilization of the module; and
- a radio authorizer element coupled to the first allower element for acting to obtain the usage authorization through a first radio channel of the communication system, and

wherein the disallower element comprises:

- a first disabler element coupled to the radio authorizer element for disabling further utilization of the module, in response to receiving a "not authorized" signal through a second radio channel of the communication system.

8. The portable communication device of claim 6, wherein the authorization element comprises:

- a determination element for making a determination of whether an internal authorization exists for utilizing the module, the determination made from an authorization record stored in the portable communication device; and
- an internal authorizer element coupled to the determination element for obtaining the usage authorization from the internal authorization, in response to the internal authorization being present in the authorization record, and

wherein the portable communication device further comprises:

- a second allower element coupled to the internal authorizer element for allowing the utilization of the module, in response to the usage authorization being obtained.

9. The portable communication device of claim 6, wherein the module is user-installed, and wherein an authorization medium is physically sent to the service provider to obtain authorization, and wherein the authorization element comprises:

- an external authorizer element for obtaining the usage authorization by receiving an external authorization from the service provider through a radio channel of the communication system, and

wherein the portable communication device further comprises:

- a second allower element coupled to the external authorizer element for allowing the utilization of the module, in response to the usage authorization being obtained.

10. The portable communication device of claim 6, wherein the usage authorization comprises information indicative of a time at which the usage authorization will expire, and

wherein the portable communication device comprises:

- a second allower element coupled to the authorization element for allowing the utilization of the module in response to obtaining the usage authorization, and
- a third disabler element coupled to the second allower element for disabling further utilization of the mod-

18

ule in response to an expiration of the usage authorization.

11. A controller for use in a fixed portion of a communication system, the controller comprising:

- a processor for controlling operation of the controller;
- a memory coupled to the processor for storing information used by the controller;
- a transmitter interface coupled to the processor for transmitting a message to a portable communication device;
- a receiver interface coupled to the processor for receiving a communication from the portable communication device;

apparatus, for authorizing utilization: of a process added to the portable communication device, the apparatus comprising:

- a process lister element coupled to the processor maintaining in the memory a list of authorized processes corresponding to the portable communication device;
- a request receiver element coupled to the processor for receiving a request for an external authorization from the portable communication device, the request comprising at least a process name and a process size corresponding to a process, along with a secure checksum and an address identifying the portable communication device;
- a list checker element coupled to the processor for checking the list of authorized processes corresponding to the portable communication device identified by the address, to determine whether the module corresponding to the module name is authorized;
- an external authorization element coupled to the processor for transmitting the external authorization to the portable communication device in response to the module being authorized for the portable communication device; and
- an authorization denial element coupled to the processor for transmitting a "not authorized" signal to the portable communication device in response to the process not being authorized for the portable communication device.

12. A method in a communication system operated by a service provider, the method for controlling utilization of a process added to a portable communication device comprising a transceiver which communicates with a fixed portion of the communication system, the method comprising in the portable communication device the steps of:

- receiving a request for utilization of the process;
- in response, acting to obtain a usage authorization for utilizing the process by
- making a determination of whether an internal authorization exists for utilizing the process, the determination made from an authorization record stored in the portable communication device, and
- communicating with the fixed portion to obtain the usage authorization as an external authorization, in response to the internal authorization being absent from the authorization record;
- allowing the utilization of the process, in response to the usage authorization being obtained; and
- disallowing the utilization of the process, in response to the usage authorization being unobtainable.

13. The method of claim 12,

wherein the process comprises a hardware module,

wherein the step of allowing the utilization of the process comprises the step of performing the process in accordance with circuits of the hardware module, and

5,612,682

19

wherein the communicating step comprises the step of transmitting to the fixed portion a signal indicative of the hardware module.

14. The method of claim 12,

wherein the process comprises a software module,

wherein the step of allowing the utilization of the process comprises the step of performing the process in accordance with instructions of the software module, and

wherein the communicating step comprises the step of transmitting to the fixed portion a signal indicative of the software module.

15. The method of claim 14, wherein the transmitting step comprises the steps of:

performing an algorithm on at least a portion of bytes of the software module to calculate a secure checksum value therefor; and

sending at least a module name and a module size corresponding to the software module, along with the secure checksum value.

16. A portable communication device in a communication system operated by a service provider, the portable communication device for controlling utilization of a process added thereto, the portable communication device comprising:

a transceiver for communicating with a fixed portion of the communication system;

a processor coupled to the transceiver for controlling the portable communication device;

a memory coupled to the processor for storing information used by the portable communication device;

user controls coupled to the processor for receiving a request for utilization of the process;

an authorization element coupled to the processor for acting to obtain a usage authorization for utilizing the process, the authorization element comprising:

a determination element for making a determination of whether an internal authorization exists for utilizing the process, the determination made from an authorization record stored in the portable communication device, and

a radio authorizer element coupled to the determination element for communicating with the fixed portion to obtain the usage authorization as an external authorization, in response to the internal authorization being absent from the authorization record;

a second allow element coupled to the radio authorizer element for allowing the utilization of the process, in response to the usage authorization being obtained; and

a disallow element coupled to the processor for disallowing the utilization of the process, in response to the usage authorization being unobtainable.

17. The portable communication device of claim 16, wherein the process comprises a hardware module, and

wherein the second allow element comprises a hardware performer element coupled to the processor for performing the process in accordance with circuits of the hardware module, and

wherein the radio authorizer element comprises a transmitter controller element coupled to a secure checksum calculator element for transmitting to the fixed portion a signal indicative of the hardware module.

18. The portable communication device of claim 16, wherein the process comprises a software module, and

wherein the second allow element comprises a software performer element coupled to the processor for per-

20

forming the process in accordance with instructions of the software module, and

wherein the radio authorizer element comprises a transmitter controller element coupled to a secure checksum calculator element for transmitting to the fixed portion a signal indicative of the software module.

19. The portable communication device of claim 18, wherein the transmitter controller element comprises:

a secure checksum calculator element coupled to the software module for performing an algorithm on at least a portion of bytes of the software module to calculate a secure checksum value therefor; and

a sender element coupled to the processor for sending at least a module name and a module size corresponding to the software module, along with the secure checksum value.

20. A method in a communication system operated by a service provider, the method for controlling utilization of a process added to a portable communication device comprising a transceiver which communicates with a fixed portion of the communication system, the method comprising in the portable communication device the steps of:

receiving a request for utilization of the process;

allowing the utilization of the process;

thereafter acting to obtain a usage authorization through a first radio channel of the communication system; and

disabling further utilization of the process, in response to receiving no external authorization reply through a second radio channel of the communication system within a predetermined time interval after the step of acting to obtain the usage authorization through the first radio channel is executed.

21. A method in a communication system operated by a service provider, the method for controlling utilization of a process added to a portable communication device comprising a transceiver which communicates with a fixed portion of the communication system, the method comprising in the portable communication device the steps of:

receiving a request for utilization of the process;

in response, acting to obtain a usage authorization from the fixed portion of the communication system for utilizing the process;

in the fixed portion of the communication system comprising the steps of:

maintaining a list of authorized processes corresponding to the portable communication device,

receiving a request for an external authorization from the portable communication device, the request comprising at least a process name and a process size corresponding to the process, along with a secure checksum and an address identifying the portable communication device,

checking the list of authorized processes corresponding to the portable communication device identified by the address, to determine whether the process corresponding to the process name is authorized,

transmitting the external authorization to the portable communication device in response to the process being authorized for the portable communication device,

transmitting a "not authorized" signal to the portable communication device in response to the process not being authorized for the portable communication device;

allowing the utilization of the process, in response to the usage authorization being obtained; and

5,612,682

21

disallowing the utilization of the process, in response to the usage authorization being unobtainable.

22. A method in a communication system operated by a service provider, the method for controlling utilization of a process added to a portable communication device comprising a transceiver which communicates with a fixed portion of the communication system, the method comprising in the portable communication device the steps of:

receiving a request for utilization of the process, wherein the process comprises a software module;

in response, acting to obtain a usage authorization for utilizing the process;

creating an internal authorization in response to obtaining an external authorization, comprising the step of generating a process verification from selected bytes of the software module, wherein the generating step comprises the steps of:

choosing the selected bytes of the software module by an address pointer defined by a random process, thereafter performing on the software module an algorithm responsive to the selected bytes to calculate a checksum value, wherein the checksum value and the address pointer become a portion of the process verification, and

thereafter storing the internal authorization in an authorization record, comprising the step of placing the process verification into the authorization record as a portion of the internal authorization; and

allowing the utilization of the process, in response to the usage authorization being obtained.

23. A portable communication device in a communication system operated by a service provider, the portable communication device for controlling utilization of a process added thereto, the portable communication device comprising:

a transceiver for communicating with a fixed portion of the communication system;

a processor coupled to the transceiver for controlling the portable communication device;

a memory coupled to the processor for storing information used by the portable communication device;

user controls coupled to the processor for receiving a request for utilization of the process;

an authorization element coupled to the processor for acting to obtain a usage authorization for utilizing the process, the authorization element comprising:

a first allower element for allowing the utilization of the process, and

a radio authorizer element coupled to the first allower element for acting to obtain the usage authorization through a first radio channel of the communication system; and

22

a disallower element coupled to the processor for disallowing the utilization of the process, in response to the usage authorization being unobtainable, the disallower element comprising a second disabler element coupled to the radio authorizer element for disabling further utilization of the process, in response to receiving no external authorization reply through a second radio channel of the communication system within a predetermined time interval after the radio authorizer element acts to obtain the usage authorization through the first radio channel.

24. A portable communication device in a communication system operated by a service provider, the portable communication device for controlling utilization of a process added thereto, the portable communication device comprising:

a transceiver for communicating with a fixed portion of the communication system;

a processor coupled to the transceiver for controlling the portable communication device;

a memory coupled to the processor for storing information used by the portable communication device;

user controls coupled to the processor for receiving a request for utilization of the process;

an authorization element coupled to the processor for acting to obtain a usage authorization for utilizing the process, wherein the process comprises a software module;

a creator element for creating an internal authorization in response to obtaining an external authorization, comprising a generator element for generating a process verification from selected bytes of the software module, wherein the generator element comprises:

a chooser element for choosing the selected bytes of the software module by an address pointer defined by a random process; and

a checksum calculator element coupled to the chooser element for performing on the software module an algorithm responsive to the selected bytes to calculate a checksum value, wherein the checksum value and the address pointer become a portion of the process verification, and

a storer element coupled to the creator element for storing the internal authorization in an authorization record in the memory, the storer element comprising a placer element for placing the process verification into the authorization record as a portion of the internal authorization; and

a disallower element coupled to the processor for disallowing the utilization of the process, in response to the usage authorization being unobtainable.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 5,612,682
DATED : March 18, 1997
INVENTOR(S) : DeLuca et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 18, line 29, delete "module" and insert --process--.
Column 18, line 30, delete "module" and insert --process--.
Column 18, line 33, delete "module" and insert --process--.

Signed and Sealed this
Ninth Day of September, 1997

Attest:



BRUCE LEHMAN

Attesting Officer

Commissioner of Patents and Trademarks

4

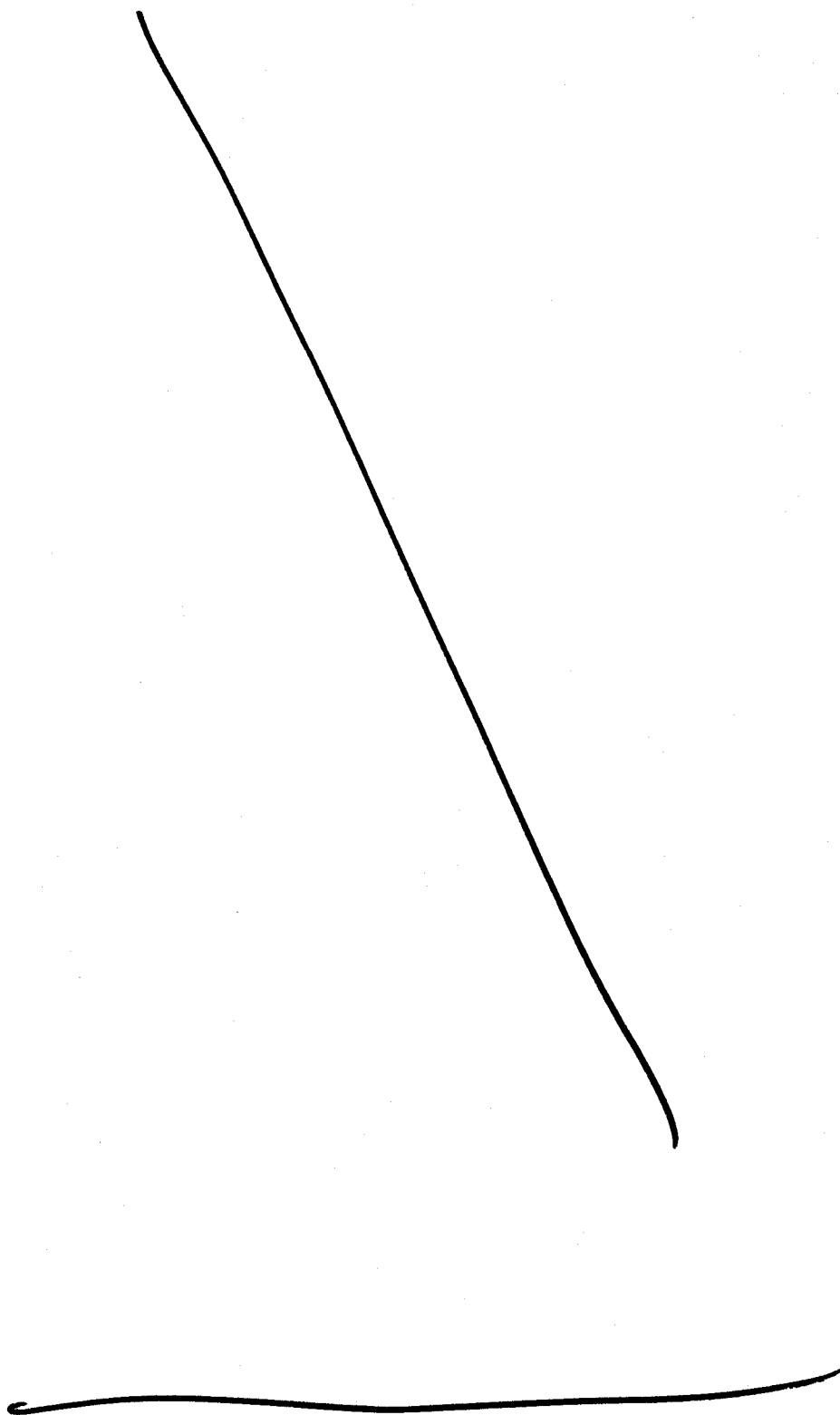
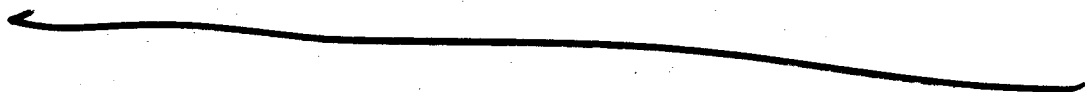


Exhibit 4

A thick, black, wavy horizontal line spanning most of the width of the page near the bottom. It has a slightly undulating or wavy appearance.



US00597447A

United States Patent [19]

Cannon et al.

[11] **Patent Number:** 5,974,447[45] **Date of Patent:** Oct. 26, 1999

[54] **METHOD AND SYSTEM FOR COUPLING A SELECTIVE CALL RECEIVER TO WIDELY DISTRIBUTED INFORMATION SOURCES**

[75] **Inventors:** Gregory Lewis Cannon, Keller; David P. Kilp, Colleyville; Nick P. Lagen, Fort Worth, all of Tex.

[73] **Assignee:** Motorola, Inc., Schaumburg, Ill.

[21] **Appl. No.:** 08/682,483

[22] **Filed:** Jul. 17, 1996

[51] **Int. Cl.⁶** G06F 13/38; G06F 15/17

[52] **U.S. Cl.** 709/206; 340/825.44; 370/313

[58] **Field of Search** 395/200.36, 200.47, 395/200.37, 200.48, 200.57; 340/825.27, 825.44, 825.49; 370/313; 455/32.1; 709/206, 217, 207, 218, 227

[56] **References Cited****U.S. PATENT DOCUMENTS**

5,239,466 8/1993 Morgan et al. .
5,475,863 12/1995 Simpson et al. .

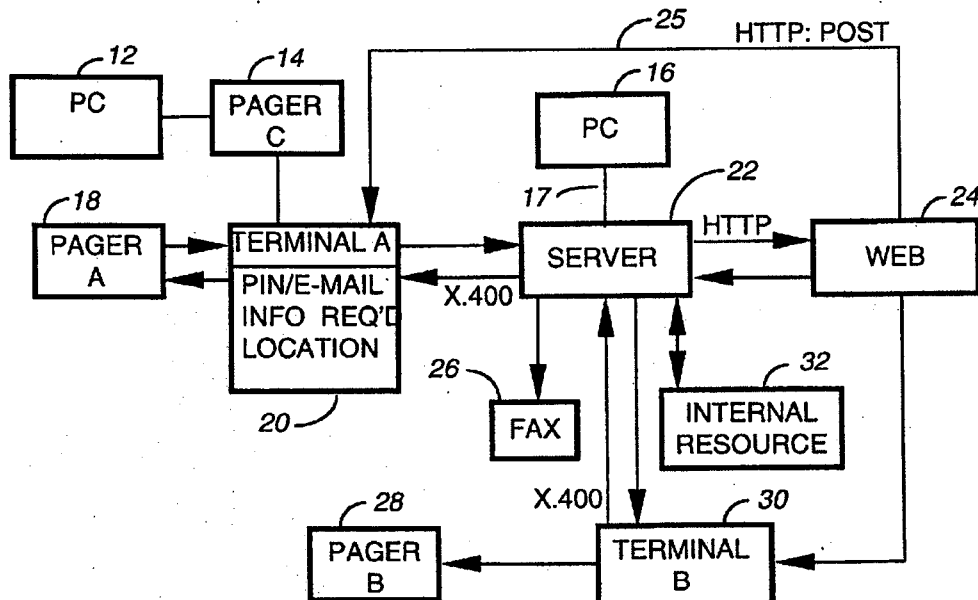
5,487,100 1/1996 Kane .
5,530,438 6/1996 Bickham et al. .
5,530,852 6/1996 Meske, Jr. et al. .
5,537,546 7/1996 Sauter .
5,608,725 3/1997 Grube et al. .
5,635,918 6/1997 Tett .

Primary Examiner—Mark H. Rinehart
Attorney, Agent, or Firm—Pablo Meles; Charles W. Bethards

[57] **ABSTRACT**

A communication system (10) for coupling a selective call transceiver (18) to a widely distributed information source (24) comprises a server (22) coupled to the widely distributed information source. The server contains agents for retrieving information customized for a given selective call transceiver. The system further includes a paging terminal (20) coupled to the server for allowing the selective call transceiver to request information from the server. The system also includes a transmitter for transmitting the pre-determined information retrieved from the widely distributed information source to the selective call transceiver.

17 Claims, 1 Drawing Sheet



U.S. Patent

Oct. 26, 1999

5,974,447

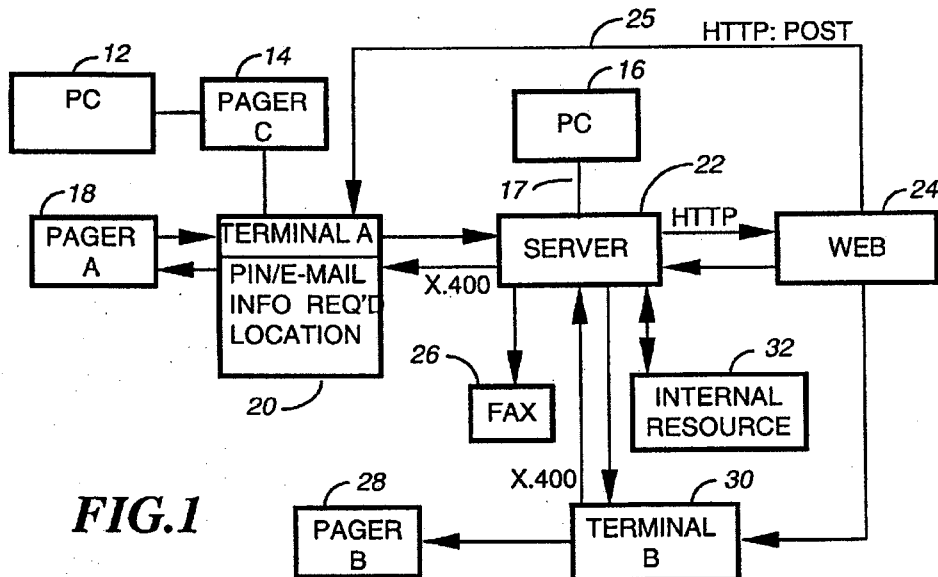
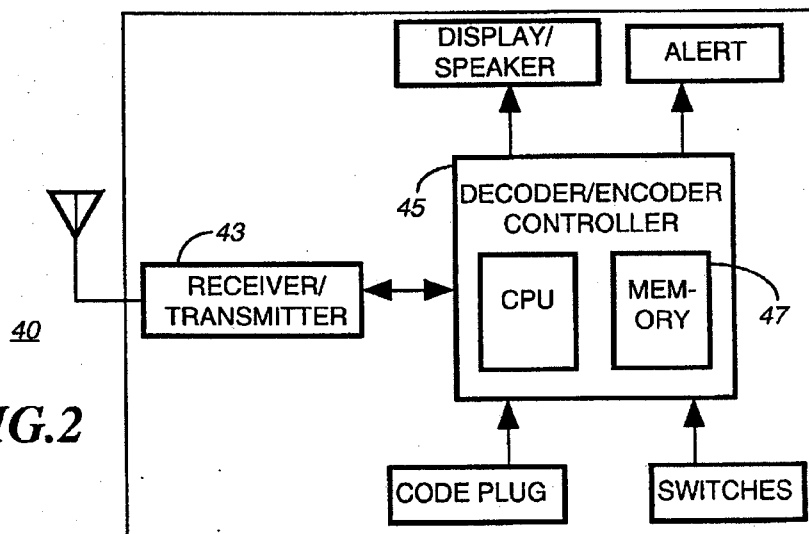


FIG. 2



5,974,447

1

METHOD AND SYSTEM FOR COUPLING A SELECTIVE CALL RECEIVER TO WIDELY DISTRIBUTED INFORMATION SOURCES

FIELD OF THE INVENTION

This invention relates in general to selective call transceivers in a two-way communication system and more specifically to retrieval of information from a widely distributed information source using a selective call transceiver.

BACKGROUND OF THE INVENTION

Retrieval of information from the internet via a wireless device is an emerging technology that will be soon be available or cellular phones using Cellular Digital Packet Data or CDPD. There is a desire to port some of this same technology to personal digital assistants and other wireless devices. A mobile user may want to access personal and updated information with the convenience of a low cost pager-sized device that uses store-and-forward technology rather than a cellular phone using real time transmissions. The information may exist on the world wide web, but a browser is not convenient, or the information may exist on proprietary information networks, and a modem is not convenient or the memory or processing required at the wireless device would raise the cost of the wireless device. Thus, there exists a need for a low cost pager-like device that can request the services of a server to dispatch an agent to obtain information for the pager-like device and return the information in store-and-forward system that takes advantage of low cost non-real time transmissions.

SUMMARY OF THE INVENTION

In a first aspect of the present invention, method for coupling a selective call transceiver to a widely distributed information source comprises the steps of operatively coupling a server to the widely distributed information source, wherein the server contains agents for retrieving information customized for a given selective call transceiver and originating a request for information at the selective call transceiver to the server and retrieving the information from the widely distributed information source using the agents in the server.

In a second aspect of the present invention a communication system for coupling a selective call transceiver to a widely distributed information source comprises a server coupled to the widely distributed information source, wherein the server contains agents for retrieving predetermined information customized for a given selective call transceiver and a communication terminal coupled to the server for allowing the selective call transceiver to request for predetermined information from the server.

In a third aspect of the present invention, a selective call transceiver capable of requesting information from a widely distributed information source coupled to a server comprises a selective call receiver coupled to a decoder and a controller, a selective call transmitter coupled to the controller and an encoder, and a memory coupled to the controller capable of dynamically changing protocol entity definitions in a synchronized manner with the server, wherein the server distributes agents on the selective call transceiver's behalf for retrieving information from the widely distributed information source for transmission back to the selective call transceiver.

In a fourth aspect of the present invention, a server for retrieving user selected information from a widely distrib-

2

uted information source using a selective call transceiver comprises a memory location for mapping user selectable inputs from the selective call transceiver and inputs from the communication system with tokens, a translator for translating the tokens at the server into retrieval commands for retrieving information from the widely distributed information source, and a formatter for formatting the retrieved information in a format suitable for reception at a device selected by a user of the selective call transceiver.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a system block diagram of a communication system in accordance with the present invention; and

FIG. 2 is a block diagram of a selective call transceiver in accordance with the present invention.

DETAILED DESCRIPTION

Referring to FIG. 1, a communication system 10 for operatively coupling a selective call transceiver 18 to a widely distributed information source 24 is shown. More particularly, the communication system 10 preferably comprises a server 22 coupled to the widely distributed information source 24, wherein the server contains agents for retrieving information customized for a given selective call transceiver. The selective call transceiver 18 is preferably operatively coupled to the widely distributed information source 24 via a terminal 20 such as Motorola's Wireless Messaging Gateway paging terminal. Operationally, the paging terminal or terminal 20 allows the selective call transceiver 18 to request information from the server 22. A transmitter (not shown) preferably coupled to the terminal 20 transmits the information retrieved from the widely distributed information source to the selective call transceiver 18. Alternatively, the selective call transceiver 18 can request the information to be forward to any number of devices such as the facsimile machine 28 or paging terminal 30.

Internet access via a two-way selective call transceiver or pager lends itself to numerous applications. Perhaps the most important would be geographically based retrieval. Certain information requested can be retrieved based on the user location as determined by the communication system 10. More specifically, a two-way paging system having a plurality of base receivers can narrow down the location of the transmitting selective call receiver as is known in the art. Thus, with location information inherent to the communication system, local information such as weather reports, traffic conditions, etc. can be sent without the user having to specify a location.

Another feature in accordance with the present invention is the ability to dynamic parse and customize information that would be delivered to a user. The information can be selected from different sources and/or formatted to account for time variable information that may need to be formatted in different ways based on system constraints such as channel capacity or user selected constraints such as cost. For instance, stock information may be available from various sources such as different web pages, each having various levels of detail and possibly graphics. The system software that resides in the server 22 will know the capabilities of the particular selective call transceiver requesting information and may even have a user profile as to the level of information desired. Based on this information, the system 10 can retrieve information from any of the available sources. The system preferably uses anchors, combinations of documentation translation utilities, and configurable text

5,974,447

3

strippers to maintain as much information as possible while eliminating as much fluff as possible. Additionally, the user can set preferences for retrieval of information web based on device size, fragmentation length, security algorithms or keys, or other parameters. Users could even set up preferences for information delivery based on personal choice and taste. Also, since much of the available information on the internet or a distributed information system is redundant and the present invention is able to map these sources, if the agent has a problem with one repository, the agent can try others in a user configurable preference order, all with dynamic parsers.

Other user preferences that can be set could include an auto searcher of information that meets a particular criteria. The agent server could periodically scan "hot lists" published by information publishers to determine if content is suitable for service by agents. Protocols would be updated to make the new services available, and mechanisms would exist to allow users of agents to learn about the existence and names of new services automatically. A user's preferences may exist such that if the length of a message or format is unsuitable to the delivery medium (due to security, privacy, cost, or capacity) then the agent would automatically forward to another mutually agreed destination or medium. A user may also set tolerance levels for time delays for delivery of information if acceptable for cost or capacity considerations. For instance a user may not mind delivery of particular information in the middle of the night if the cost is lower and the information is not time critical.

Another feature in accordance with the present invention is user controlled message routing. As previously mentioned, a user of a selective call transceiver using this information retrieval system typically wants the agent in the server to deliver the information back to the user, using the same channels that the user used to get to the agent. On occasion, the user may want to deliver specific information to someone or something else. Thus, a company's web page explaining product prices could be transmitted to a prospective client to their given facsimile number or electronically mailed to a particular electronic mail account.

Another beneficial feature of the present invention that particularly assists in reducing the amount of information sent inbound to a paging terminal and saves the user from entering additional information is intelligent query handling based on session context. The agent in the server will keep a state machine of user requests for a given session. The agent will then respond to command, in a context sensitive manner, thus allowing the commands to have many more meanings in a sequential context. For example, if business financials are asked for a particular company, and the next query in news, instead of sending all of the news, the agent could gather just the news about the current company the agent was already finding things about. Of course, this capability is preferably user configurable as well as overridden if desired. Again, this feature diminishes parameters being sent over the air and thus increases capacity. In another related aspect of the present invention, each session could be dynamically encoded depending upon the information resource the selective call receiver is retrieving information from. In other words, instead of having static lists for what canned codes mean on forward or reverse channels, the codes change meaning depending on where the user is in the session. There would preferably be a high level protocol that would synchronize these codes.

The system 10 can preferably keep statistics on particular users, identify certain users as high profile or power users, and make decisions to follow or learn about that user's

4

behavior. The system may even setup an auto monitor that follows agent request usage patterns. The server 22 could then automatically suggest the use of these monitors to the user. Furthermore, the system could reconfigure the user's device to use a more individual protocol to reduce the airtime that the user uses to communicate to the agent, and vice-versa. This could give a great deal of channel capacity.

Preferably the server 22 can be modified to customize or optimize operations, maintenance, and testing of the system 10. Administrators of the agent server 22 can query the status of agents and server resources and remotely enable or disable users, agents and/or services. The administrators can do this either through administration agents or through any other server entry point such as a personal computer 16 couple to the server 22 via link 17.

As paging technology progresses towards the world of multimedia, there will be time when a selective call receiver can receive not only text, but graphics as well as sound in one portable unit. A server in accordance with the present invention will eventually need the capability to split the available retrievable information on the basis of text, graphics and sound. Some of this technology on the portable subscriber side is beginning to emerge with Motorola's TENOR™ voice messaging unit using Motorola's InFLEXion™ Voice over-the-air protocol. Thus, if a particular TENOR™ subscriber unit only had voice capability and the source of information was only available in text, the agent at the server would include a text to speech converter or translator allowing for audible "viewing" of the text. Likewise, if a graphical image had text within the image, and the subscriber unit requesting information only had the capability to see text, then the agent at the server could include a system for optical character recognition and convert the image to text. As another example, if the information available on the web was digitized video, and the subscriber unit only had limited memory, and graphics display capability, then the video could be selectively displayed as a series of graphic illustrations based on device display capability and other considerations.

In another aspect of the present invention, the use of multiple choice responses can be effectively used to simulate an interactive web browser such that information links identified by the server can be mapped into dynamic prompted responses for the user. This allows substantial reduction in the bandwidth required for the user to select specific information that the user desires.

Another aspect of the present invention would allow for user sessions. In other words, the server would allow users to access gateways that allow communication between different medium such as telephone, fax, or even other paging gateways or terminals from different carriers which might operate using different wireless protocols. For example, pager A (18) requests access to the resources (in this instance a computer 12 coupled selective call transceiver 14) of pager C (14). The user of pager C grants access to their resources to user A through the server 22. Pager A is notified and accesses pager C and then stops access. Pager A and C can then set up a session to set up parameters between them such as security algorithms or keys and, compression ratios without the server 22. The sessions could be set up between pagers on different paging networks, for instance between pager A (18) communicating with terminal A (20) and pager B (28) communicating with terminal B (30).

Operationally, the present invention comprises a method for coupling a selective call transceiver 18 to a widely distributed information source 24. A server 22 is operatively

5,974,447

5

coupled to the widely distributed information source, preferably using an http post protocol wherein the server contains agents for retrieving information customized for a given selective call transceiver. A request for information is originated at the selective call transceiver to the server via a paging terminal 20 operatively coupled to the server. Information can be routed back and forth between the server and the paging terminal using an e-mail protocol such as x.400 or back and forth between the server and the paging terminal via the internet or web using the http post protocol. In any event, the information is then retrieved from the widely distributed information source using the agents in the server. The widely distributed information source can be the world wide web, also known as the "web". The information is then transmitted to the selective call transceiver. Ideally, location information for the selective call transceiver is obtained by receiving transmissions from the selective call transceiver at least one of a plurality of base receivers (not shown) and providing the location information to the agents to further customize the predetermined information being retrieved. Preferably, the information is dynamically parsed in a format configured for a particular selective call transceiver user. Additionally, the selective call transceiver can direct the retrieved information to second communication device such as a facsimile machine 26, a computer 12 having an electronic mail account, a pager 28, or a cellular phone (not shown). Finally, the method of the present invention may further comprise keeping a state machine of the transceiver user requests, allowing the agent to respond to commands in a context sensitive manner.

In other words, the present invention dynamically changes protocol entities in a synchronized manner between the selective call transceiver and the server and preferably receives the entities at a dedicated server that distributes agents on the selective call transceiver's behalf to find information on the widely distributed information source. The protocol entities can be viewed as command sets or canned messages with mapped meanings. Preferably, the protocol between the dedicated server and the agent is modified to optimize the cost of communication over the air. The agents can be directed to provide varying levels of information detail based on cost and capacity constraints.

In other terms, a method for retrieving user selected information from a widely distributed information source using a selective call transceiver in a communication system preferably comprises the steps of mapping user selectable inputs from the selective call transceiver and inputs from the communication system with tokens at a remote server in communication with the selective call transceiver and translating the tokens at the remote server into retrieval commands for retrieving information from the widely distributed information source. The method may also comprise the step of retrieving the information from the widely distributed information source and formatting the information in a format suitable for reception at the selective call receiver or alternatively formatting the information in a format suitable for reception at a device selected by user of the selective call transceiver.

A selective call transceiver 40 in accordance with the present invention as depicted FIG. 2 would preferably comprise a selective call receiver 43 coupled to a decoder 45 and a controller 45, a selective call transmitter 43 coupled to the controller 45 and an encoder 45, a memory 47 coupled to the controller capable of dynamically changing protocol entity definitions in a synchronized manner with the dedicated server, wherein the dedicated server distributes agents on the selective call transceiver's behalf for retrieving

6

information from the widely distributed information source for transmission back to the selective call transceiver.

A server for retrieving user selected information from a widely distributed information source using a selective call for requesting information wirelessly from the server preferably comprises a memory location for mapping user selectable inputs from the selective call transceiver and inputs from the communication system with tokens, a translator for translating the tokens at the server into retrieval commands for retrieving information from the widely distributed information source, and a formatter for formatting the retrieved information in a format suitable for reception at a device selected by a user of the selective call transceiver. The user selectable inputs can be inputs that assist in screening information based on content, cost to the user, or system constraints. Ideally, inputs from the communication system automatically include all the constraints associated with capacity, location, and possibly user profiles that are retained or observed by the system. For instance, such user profiles can contain the particular limitations of the selective call transceiver used by the user (whether it has sufficient memory, handles voice, text only, graphics only, or any combination of the preceding), or the usage patterns of the user based on location (viewing New York Times when in New York and the Miami Herald when in South Florida). In any event, the server would be able to handle much of the processing since the selective call transceiver is preferably a two-way pager using a communication system that is a non-real-time store-and-forward paging system.

What is claimed is:

1. A method for coupling a selective call transceiver to a widely distributed information source, comprising the steps of:

operatively coupling a server to the widely distributed information source, wherein the server contains agents for retrieving information from the widely distributed information source that is customized for a given selective call transceiver;

originating, at a communication terminal operatively coupled to the server, a request of the server for such information to be provided to the selective call transceiver; and

retrieving the information from the widely distributed information source using the agents in the server.

2. The method of claim 1, wherein the method further comprises the step of transmitting the retrieved information to the selective call transceiver.

3. The method claim 1, wherein the method further comprises the step of obtaining location information for the selective call transceiver by receiving transmissions from the selective call transceiver at at least one of a plurality of base receivers and providing the location information to the agents to further customize the predetermined information being retrieved.

4. The method of claim 1, wherein the method further comprises the step of dynamically parsing the retrieved information in a format configured for a particular selective call transceiver user.

5. The method of claim 1, wherein the method further allows the selective call transceiver to direct the retrieved information to a second communication device, wherein the second communication device is selected from the group consisting of a facsimile machines, a computer having an electronic mail account, a pager, and a cellular phone.

6. The method of claim 1, wherein the method further comprises the step of keeping a state machine of the transceiver user requests allowing the agent to respond to commands in a context sensitive manner.

5,974,447

7

7. Method for coupling between a selective call transceiver to a widely distributed information source, comprising the steps of:

dynamically changing protocol entities in a synchronized manner within the selective call transceiver;
receiving the entities at a dedicated server that distributes agents on the selective call transceiver's behalf to find information on the widely distributed information source; and

modifying a protocol between the dedicated server and the agent to optimize the cost of communication over the air.

8. A communication system for coupling a selective call transceiver to a widely distributed information source, comprises:

a server coupled to the widely distributed information source, wherein the server contains agents for retrieving predetermined information customized for a given selective call transceiver;

a paging terminal coupled to the server for allowing the selective call transceiver to request such predetermined information from the server; and

a transmitter for transmitting the predetermined information retrieved from the widely distributed information source to the selective call transceiver.

9. A communication system for seamless coupling between a selective call transceiver and a widely distributed information source, comprises:

a selective call transceiver that dynamically changes protocol entities in a synchronized manner; and

a selective call terminal coupled to a dedicated server for receiving the protocol entities, wherein the dedicated server distributes agents on the selective call transceiver's behalf to find information on the widely distributed information source.

10. A selective call transceiver capable of requesting information from a widely distributed information source coupled to a server, comprises;

a selective call receiver coupled to a decoder and a controller;

a selective call transmitter coupled to the controller and an encoder;

a memory coupled to the controller capable of dynamically changing protocol entity definitions in a synchronized manner with the server, wherein the server distributes agents on the selective transceiver's behalf for

8

retrieving information from the widely distributed information source for transmission back to the selective call transceiver.

11. A server for retrieving user selected information from a widely distributed information source using a selective call transceiver in a communication system for requesting information wirelessly from the server, the server comprising:

a memory location for mapping user selectable inputs from the selective call transceiver and inputs from the communication system with tokens;

a translator for translating the tokens at the server into retrieval commands for retrieving information from the widely distributed information source; and

a formatter for formatting the retrieved information in a format suitable for reception at a device selected by a user of the selective call transceiver.

12. The server of claim 11, wherein the selective call transceiver is a two-way pager and the communication system is a non-real time store and forward paging system.

13. The server of claim 11, wherein the user selectable inputs include information content preferences and cost preferences.

14. The server of claim 11, wherein the inputs from the communication system includes selective call receiver location information.

15. A method for retrieving user selected information from a widely distributed information source using a selective call transceiver in a communication system, comprising the steps of:

mapping user selectable inputs from the selective call transceiver and inputs from the communication system with tokens at a remote server in communication with the selective call transceiver; and

translating the tokens at the remote server into retrieval commands for retrieving information from the widely distributed information source.

16. The method of claim 15, wherein the step further comprises the step of retrieving the information from the widely distributed information source and formatting the information in a format suitable for reception at the selective call receiver.

17. The method of claim 15, wherein the step further comprises the step of retrieving the information from the widely distributed information source and formatting the information in a format suitable for reception at a device selected by user of the selective call transceiver.

* * * * *

CIVIL COVER SHEET

JS 44 (Rev. 11/04)

This JS 44 civil cover sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. (SEE INSTRUCTIONS ON THE REVERSE OF THE FORM.)

I. (a) PLAINTIFFS

Research in Motion Corporation and Research in Motion Limited

DEFENDANTS

Motorola, Inc.

(b) County of Residence of First Listed Plaintiff

(EXCEPT IN U.S. PLAINTIFF CASES)

Dallas, Texas

County of Residence of First Listed Defendant

Cook, Illinois

(IN U.S. PLAINTIFF CASES ONLY)

NOTE: IN LAND CONDEMNATION CASES, USE THE LOCATION OF THE LAND INVOLVED.

(c) Attorney's (Firm Name, Address, and Telephone Number)

John R. Emerson, Haynes and Boone LLP, 901 Main St., Ste. 3100,
Dallas, TX 75202; 214.651.5000; fax 214.651.5940

Attorneys (If Known)

II. BASIS OF JURISDICTION

(Place an "X" in One Box Only)

☐ 1 U.S. Government Plaintiff

☒ 3 Federal Question
(U.S. Government Not a Party)

☐ 2 U.S. Government Defendant

☐ 4 Diversity
(Indicate Citizenship of Parties in Item III)

III. CITIZENSHIP OF PRINCIPAL PARTIES

(Place an "X" in One Box for Plaintiff and One Box for Defendant)

(For Diversity Cases Only)

Citizen of This State

☐ PTF
☐ DEF

Incorporated or Principal Place of Business In This State

☐ PTF
☐ DEF

Citizen of Another State

☐ 2
☐ 2

Incorporated and Principal Place of Business In Another State

☐ 5
☐ 5

Citizen or Subject of a Foreign Country

☐ 3
☐ 3

Foreign Nation

☐ 6
☐ 6

IV. NATURE OF SUIT

(Place an "X" in One Box Only)

CONTRACT	TORTS	FORFEITURE/PENALTY	BANKRUPTCY	OTHER STATUTES
<input type="checkbox"/> 110 Insurance <input type="checkbox"/> 120 Marine <input type="checkbox"/> 130 Miller Act <input type="checkbox"/> 140 Negotiable Instrument <input type="checkbox"/> 150 Recovery of Overpayment & Enforcement of Judgment <input type="checkbox"/> 151 Medicare Act <input type="checkbox"/> 152 Recovery of Defaulted Student Loans (Excl. Veterans) <input type="checkbox"/> 153 Recovery of Overpayment of Veteran's Benefits <input type="checkbox"/> 160 Stockholders' Suits <input type="checkbox"/> 190 Other Contract <input type="checkbox"/> 195 Contract Product Liability <input type="checkbox"/> 196 Franchise	PERSONAL INJURY <input type="checkbox"/> 310 Airplane <input type="checkbox"/> 315 Airplane Product Liability <input type="checkbox"/> 320 Assault, Libel & Slander <input type="checkbox"/> 330 Federal Employers' Liability <input type="checkbox"/> 340 Marine <input type="checkbox"/> 345 Marine Product Liability <input type="checkbox"/> 350 Motor Vehicle <input type="checkbox"/> 355 Motor Vehicle Product Liability <input type="checkbox"/> 360 Other Personal Injury PERSONAL INJURY <input type="checkbox"/> 362 Personal Injury - Med. Malpractice <input type="checkbox"/> 365 Personal Injury - Product Liability <input type="checkbox"/> 368 Asbestos Personal Injury Product Liability PERSONAL PROPERTY <input type="checkbox"/> 370 Other Fraud <input type="checkbox"/> 371 Truth in Lending <input type="checkbox"/> 380 Other Personal Property Damage <input type="checkbox"/> 385 Property Damage Product Liability	<input type="checkbox"/> 610 Agriculture <input type="checkbox"/> 620 Other Food & Drug <input type="checkbox"/> 625 Drug Related Seizure of Property 21 USC 881 <input type="checkbox"/> 630 Liquor Laws <input type="checkbox"/> 640 R.R. & Truck <input type="checkbox"/> 650 Airline Regs. <input type="checkbox"/> 660 Occupational Safety/Health <input type="checkbox"/> 690 Other LABOR <input type="checkbox"/> 710 Fair Labor Standards Act <input type="checkbox"/> 720 Labor/Mgmt. Relations <input type="checkbox"/> 730 Labor/Mgmt. Reporting & Disclosure Act <input type="checkbox"/> 740 Railway Labor Act <input type="checkbox"/> 790 Other Labor Litigation <input type="checkbox"/> 791 Empl. Ret. Inc. Security Act	<input type="checkbox"/> 422 Appeal 28 USC 158 <input type="checkbox"/> 423 Withdrawal 28 USC 157 PROPERTY RIGHTS <input type="checkbox"/> 820 Copyrights <input checked="" type="checkbox"/> 830 Patent <input type="checkbox"/> 840 Trademark SOCIAL SECURITY <input type="checkbox"/> 861 HIA (1395ff) <input type="checkbox"/> 862 Black Lung (923) <input type="checkbox"/> 863 DIWC/DIWW (405(g)) <input type="checkbox"/> 864 SSID Title XVI <input type="checkbox"/> 865 RSI (405(g)) FEDERAL TAX SUITS <input type="checkbox"/> 870 Taxes (U.S. Plaintiff or Defendant) <input type="checkbox"/> 871 IRS—Third Party 26 USC 7609	<input type="checkbox"/> 400 State Reapportionment <input type="checkbox"/> 410 Antitrust <input type="checkbox"/> 430 Banks and Banking <input type="checkbox"/> 450 Commerce <input type="checkbox"/> 460 Deportation <input type="checkbox"/> 470 Racketeer Influenced and Corrupt Organizations <input type="checkbox"/> 480 Consumer Credit <input type="checkbox"/> 490 Cable/Sat TV <input type="checkbox"/> 810 Selective Service <input type="checkbox"/> 850 Securities/Commodities/Exchange <input type="checkbox"/> 875 Customer Challenge 12 USC 3410 <input type="checkbox"/> 890 Other Statutory Actions <input type="checkbox"/> 891 Agricultural Acts <input type="checkbox"/> 892 Economic Stabilization Act <input type="checkbox"/> 893 Environmental Matters <input type="checkbox"/> 894 Energy Allocation Act <input type="checkbox"/> 895 Freedom of Information Act <input type="checkbox"/> 900 Appeal of Fee Determination Under Equal Access to Justice <input type="checkbox"/> 950 Constitutionality of State Statutes
REAL PROPERTY <input type="checkbox"/> 210 Land Condemnation <input type="checkbox"/> 220 Foreclosure <input type="checkbox"/> 230 Rent Lease & Ejectment <input type="checkbox"/> 240 Torts to Land <input type="checkbox"/> 245 Tort Product Liability <input type="checkbox"/> 290 All Other Real Property	CIVIL RIGHTS <input type="checkbox"/> 441 Voting <input type="checkbox"/> 442 Employment <input type="checkbox"/> 443 Housing/Accommodations <input type="checkbox"/> 444 Welfare <input type="checkbox"/> 445 Amer. w/Disabilities - Employment <input type="checkbox"/> 446 Amer. w/Disabilities - Other <input type="checkbox"/> 440 Other Civil Rights	PRISONER PETITIONS <input type="checkbox"/> 510 Motions to Vacate Sentence Habeas Corpus: <input type="checkbox"/> 530 General <input type="checkbox"/> 535 Death Penalty <input type="checkbox"/> 540 Mandamus & Other <input type="checkbox"/> 550 Civil Rights <input type="checkbox"/> 555 Prison Condition		

V. ORIGIN

(Place an "X" in One Box Only)

☒ 1 Original Proceeding

☐ 2 Removed from State Court

☐ 3 Remanded from Appellate Court

☐ 4 Reinstated or Reopened

☐ 5 Transferred from another district (specify)

☐ 6 Multidistrict Litigation

☐ 7 Appeal to District Judge from Magistrate Judgment

Cite the U.S. Civil Statute under which you are filing (Do not cite jurisdictional statutes unless diversity):

VI. CAUSE OF ACTION

Brief description of cause: Patent infringement litigation

28 U.S.C. §§ 1331, 1338(a), 2201, and 2202

VII. REQUESTED IN COMPLAINT:

☐ CHECK IF THIS IS A CLASS ACTION UNDER F.R.C.P. 23

DEMAND \$

CHECK YES only if demanded in complaint:

JURY DEMAND: ☒ Yes ☐ No

VIII. RELATED CASE(S) IF ANY

(See instructions):

JUDGE

Fish

DOCKET NUMBER

3:08CV0284-G

DATE

SIGNATURE OF ATTORNEY OF RECORD

2/21/2008

FOR OFFICE USE ONLY

RECEIPT #

AMOUNT

APPLYING IFP

JUDGE

MAG. JUDGE